A CONTRIBUTION TO EPIDEMIOLOGY

THE INCIDENCE OF EPIDEMIC DISEASE AMONG TROOPS AND CIVILIANS IN A WAR ZONE, WITH PARTICULAR REFERENCE TO DIARRHOEAL DISEASES.

by

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I N D E X.

I N T R O D U C T I O N.

It was through a retreating rabble of disorganised infantry, who had flung away rifles and all military accoutrements in their retiral, that the British Troops, early in November 1917, marched up to the forward area on the Italian front.

To anyone not acquainted with all the circumstances of the case, and particularly if one is ignorant of the Italian temperament, the retreat of the Italian Army, which started from the sector round the little Alpine village of Caporetto on 24th October 1917, is well-nigh inexplicable. All the more so if one knew what prodigies of valour they had accomplished since their entry into the World War on 24th May 1915 - their final war of the "Risorgimento" with all it meant to the Italian idealist longing for the fulfilment of Garibaldi's dream of "Italia Redenta" - Italy Redeemed.

In their first rush after declaring war, the Italians had carried their 300 mile front of high Alps into Austrian territory. Monte Sabatino, an almost impregnable mountain, together with a devastating outbreak of Cholera (14,000 cases with a mortality of 46%) delayed the capture of Gorizia until August 1916 by an offensive on a gigantic scale on the/

the Isonzo and Carso on terrain whose immense difficulties must be seen to be believed. The Carso in particular, a vast limestone table land in which trenches had to be blasted, without shade or shelter and practically waterless, was a fit scene for warfare such as only a Dante could conceive.

And yet step by step on the Carso and Isonzo and the Higher Alps, the Italian advance forged slowly on, though at terrible cost, with Trieste as the objective.

Further great offensives from Plava and Gorizia during May to September in 1917 with victories at Monte Kuk, Monte Santo, San Gabriele and on the Bainsizza plateau, saw the Italians reach the high-water mark of their successes.

And then this wonderful army which had done impossibly brave things, performed engineering and mountaineering feats almost incredible, suddenly collapsed. The depths of the Caporetto disaster were possible only because the Italian Army was capable of such wonderful heights.

Over two years had been spent in the trenches amid incredible hardships and dangers: skilful diffusion of enemy propaganda acted with volcanic effect on volatile temperaments already further depressed by news of the hardships endured by the women and children at home. To crown all the sector at Caporetto was held by regiments which had shortly before received large/

large drafts of disaffected pacifist strikers from the commercial cities of central Italy.

The military genius of Ludendorff chose the psychological place and time, and thus it was that in November 1917 French and British troops, hastily withdrawn from the western front, found themselves marching up to the Italian front through retreating troops who had shed the last vestige of their morale.

The Caporetto disaster and all that followed disorganised not only the fighting portion of the Italian Army, but all the administrative services as well, including of course the medical service.

Large numbers of hospitals with all their equipment and innumerable medical officers with their staffs were captured or lost during those dark days; and when the reorganisation of the Italian Army took place, this loss both of personnel and material was difficult to replace.

More civilian practitioners had to be called up to replace these numerous casualties and this undoubtedly affected adversely the civilian population who were left with an insufficient number of overworked doctors.

Add to this the tremendous congestion in the Zona di Guerra caused by the presence not only of most of the original poorer inhabitants, but of considerable numbers/

numbers of refugees from the occupied territory, and the presence too of vast numbers of troops - Italian, French and British - and the wonder is that the incidence of epidemic disease was not infinitely greater than it turned out to be.

THE BRITISH TROOPS IN ITALY.

During the critical days at the end of 1917 and beginning of 1918, when the possibility of a further Austrian break through by the valleys of the Astico or Brenta was an ever-present danger, General Sir Herbert Plumer was Commander-in-Chief of the British Forces which consisted of five Divisions. Three of these Divisions were located on the Montello, a rounded oblong hill forming part of the foothills of the Alps, which was the hinge of the Italian front between the mountains and the sea. The other two divisions were in reserve in the neighbourhood of Cittadella in the Province of Padua.

By the spring of 1918 the position was consolidated, Italian morale was restored, the Austrians were palpably contained, and the pressing needs of the Western front compelled a withdrawal of two of our Divisions (the 5th and 41st). The remaining three Divisions (7th, 23rd and 48th) came under the command of General Lord Cavan.

With the advent of good weather, the British troops were relieved on the Montello by Italians, and took over a mountain sector on the Asiago Plateau where they, together with two French Divisions and a varying number of Italian Divisions, formed the Sixth Italian Army/

Army under General Montuori. While holding this front two divisions were in line on the Plateau and one division was held in reserve on the plains - the whole area being in the Province of Vicenza.

During the early summer this sector was quiet, but on June 15th after an intensive bombardment, the Austrians attempted their last great offensive in conjunction with the German offensive on the Western front. The attack was completely repulsed after hard fighting and it was then generally considered that Austria had shot her bolt.

Meanwhile, during the whole summer the reorganisation of Italy - her armies at the front and her civilian population at home - had steadily and miraculously progressed, and the repulse of the Austrian attack in June put the finishing touches to the process of restoring the nation's morale, a process which had been steadily fostered since Caperetto. The plans elaborated by Italian Commando Supremo were gradually completed and culminated in the final victorious offensive, the battle of Vittorio Veneto, which ended in the complete defeat of the whole Austrian Army.

In pursuance of this plan one of the British Divisions, the 48th, was left in line on the Plateau and took part in the final advance there.

The/

The 7th and 23rd Divisions were moved secretly to the Piave, and, as part of the Tenth Italian Army, command of which devolved on Lord Cavan, took a big share in the final decisive battle which was launched on 24th October and ended in Austria suing for an Armistice on 4th November.

AREAS OCCUPIED BY THE BRITISH TROOPS IN ITALY.

The troops on arrival in November 1917 were mostly detrained in the area between Mantua and Padua and marched thence by stages to the first British sector - the Montello area - where we had the French on our left. This sector was allotted to us not only because of its tactical importance, but also because, as snow was imminent, it was considered by Italian Commando Supremo that our troops would not be able to stand the severe winter conditions in the Alpine sectors, being unaccustomed to such warfare and being without the special mountain equipment necessary.

This Montello sector was a distinct feature by itself of the Italian front - a long low hog-backed hill acting as a hinge to the whole Italian line and linking up that portion which faced north from Mt. Tomba to Lake Garda with the defensive line of the river Piave which protected Venice. This sector we took over on 4th December 1917 and held until March 18th 1918. During that period there was no severe fighting - the Piave river having a breadth at this point of over a thousand yards and a current of 14 knots - but continuous patrol work was carried out and various lines of defence were organised. Casualties were relatively few and the health of the troops was excellent.

It was decided that British Troops should hold some portion of the mountain front during the summer months, and the exact portion taken over was on the Asiago Plateau (3000 to 4000 feet). This area was occupied by us by March 29th and though not a real "Alpine" sector in comparison with a great portion of the Italian front, still it was high enough and precipitous enough to necessitate the conversion of transport and equipment to a mountain establishment.

As we only held a few miles of the depth of the plateau - the remainder of it and the high mountains beyond being in Austrian hands - only the troops in line were on the Plateau and those in reserve were scattered about in various areas in the Province of Vicenza in the plains.

Whilst holding this sector complete mastery of "No-man's land" was obtained and retained by us by means of continual raids, and casualties were correspondingly few. On June 15th the Austrian offensive took place but was completely repulsed.

As far as health was concerned the summer of 1918 was luckily for us not abnormally hot for Italy, but the troops in reserve on the plains undoubtedly felt the unaccustomed heat with results which will be brought out later in the survey of Diarrhoeal Diseases.

Lastly, on October 21st 1918 the two British Divisions/

Divisions which had been moved secretly to the Piave, took over part of the front there from Salletuol to Palazzon and took part in the final grand offensive. This was a malarial area as will be referred to later.

Our lines of communication were of necessity very much spread out, the most important aggregations of troops being at Tortona, Voghera, Cremona and Genoa. In addition to this there were various places on the Mediterranean L. of C. under our administration, the most important being Taranto.

MEDICAL ARRANGEMENTS FOR BRITISH FORCES IN ITALY.

The Medical Arrangements may be most conveniently considered under the headings of (a) Forward Area, (b) Lines of Communication and (c) Base.

A. FORWARD AREA.

I. Regimental Medical Officers.

Each battalion of infantry, brigade of artillery, or equivalent formation, has one medical officer attached to the unit headquarters who moves with the unit and, if he is a good and zealous officer, becomes in fact an integral and exceedingly important part of that unit. Under him are the regimental stretcher-bearers (normally the bandsmen) who have a certain amount of training in first-aid, etc. He forms a Regimental Aid-Post while the unit is in action, and a Sick-room when out of the line.

II. Field Ambulance.

Each Division has, as part of its establishment, three Field Ambulances - one for each Brigade. The War Establishment of each of these consists of 10 officers and 182 other ranks of the R.A.M.C. There are also attached 52 other ranks of the R.A.S.C. (Horse transport and motor transport). For the transport of sick and wounded each Field Ambulance/

Ambulance has three horse-drawn ambulance wagons and seven motor ambulances.

A fairly comprehensive medical and surgical equipment is carried, and impromptu hospital accommodation can be rapidly improvised by these mobile units, either in the tents which are carried or, as is more usually the case, in buildings taken over for the purpose.

As a general rule one Field Ambulance, or Section thereof, is set aside for the reception of all cases of Infectious Disease.

In action the Field Ambulances form Relay Posts for hand-carriage by stretcher to the rear of casualties; Collecting Posts for the marshalling of walking casualties; Advanced Dressing Stations and Main Divisional Dressing Stations.

Except during very active operations, one Field Ambulance or section thereof is also usually detailed to form a Divisional Rest Station for the rest and recuperation of "petits malades".

III. Casualty Clearing Stations.

From the Divisional Dressing Stations cases are removed by ambulance to the Casualty Clearing Stations, which are hospitals of more permanent nature where all immediate operations are performed prior to evacuation to the Base.

These/

These are allotted usually in the ratio of one per division employed.

As with Field Ambulances, one C.C.S. or portion thereof is set aside solely for the reception of "Special" cases, in which are included all Infectious or Contagious Diseases usually mated ignominiously, it must be confessed, with Venereal Diseases and Self-inflicted Wounds.

IV. Advanced Depot of Medical Stores.

This as its name implies, is simply a dump from which all medical units in the forward area draw medical stores on indent.

B. LINES OF COMMUNICATION.

Under this head we may include Ambulance Trains in which cases are transported from the Casualty Clearing Stations to the Base.

But in Italy also, in view of the scattered nature of our L. of C., we posted (at Cremona) a Stationary Hospital for the reception of milder cases likely to recover quickly and be fit for duty, and also for the reception of very serious cases unable to undertake the long journey to the Base without a break.

From the tactical point of view also, in this case it was considered advisable to open a large hospital/

hospital on the L. of C. inasmuch as, in the event of a break through by the enemy, the wounded could at a pinch be transported direct to Cremona by motor ambulance convoy.

C. BASE.

At the Base are General Hospitals and Stationary Hospitals.

The Base hospitals for the Italian front were located at Genoa and at Bordighera on the Ligurian Riviera, where also we formed Convalescent Depots for both officers and men.

All the buildings we took over were excellent for the purpose, mostly large and luxurious hotels in fact; and the climate and surroundings were alike conducive to rapid recovery.

A Base Depot of Medical Stores was also situated at Genoa.

In addition to all those purely medical units, there were Mobile Laboratories both Bacteriological and Hygienic, and one of these was always posted at the Casualty Clearing Station or Hospital set aside for the reception of Infectious Diseases. Another most important link in the prevention and investigation of notifiable diseases was the Sanitary Section which I think requires explanation in greater detail.

THE SANITARY SECTION.

At the beginning of the War, the Sanitary Section as laid down in War Establishments consisted of one Medical Officer in charge and 25 other ranks trained in Sanitary Work.

Until the latter end of 1916, a Sanitary Section was allotted to each Division, moved with the Division, and exercised functions in part supervisory but also largely practical, inasmuch as they actually constructed most latrines, urinals, incinerators etc. of anything like a permanent nature for their Division.

In the more or less stationary trench warfare on the Western front during 1915 - 16 it was found that this system led to a great deal of over-lapping and lack of co-ordination, as a Division, on moving, usually attempted to move with it a considerable proportion of the fittings constructed by its Sanitary Section. As one Division only moved to be replaced by another, the incoming units found a more or less complete lack of sanitary fittings and if any did exist they probably did not conform to the type the new Division was accustomed to. The result was that new fittings of an infinite variety of types were constantly being made and scrapped as Division succeeded Division in any particular area.

Towards the end of 1916 a recommendation was made/

made from G.H.Q. France, that Sanitary Sections should become Area Troops - be permanently settled in a definite sector which they continually patrolled, and co-ordinate the sanitary work of each new incoming unit as it moved into their area.

The XVth Army Corps on the Somme, of which I was D.A.D.M.S. at the time, was I believe the first formation to adopt and carry out this scheme, and we found it a great advance on the older method, although we always made the proviso that in the event of open warfare occurring again we would at once post a Sanitary Section to each Division for any big advance.

About this time too, owing to the shortage of medical officers, the majority of those in command of Sanitary Sections were withdrawn and their places taken by officers who, though not medical men, were given temporary commissions in the R.A.M.C.

These officers were drawn from a variety of professions and trades but the only time one regretted that they were not medical men was during an epidemic, particularly if such occurred amongst the civilians of their area. But even then they quickly learned to undertake investigations and the inspectional and disinfecting duties generally which are usually relegated to a Sanitary Inspector in this country.

Each Sanitary Section maintained a workshop where models of all Field Sanitary appliances were kept on show,/

show, and to which fighting units could send their pioneer personnel for instruction and help in making the required articles for the unit.

Their personnel continually patrolled and inspected the whole area for the discovery of nuisances and for the purpose of advising incoming units as to the sanitary arrangements of the area.

They periodically tested and labelled all sources of water supply in their area.

The Sanitary Section also supervised or carried out disinfection after cases of infectious disease among troops or civilians.

In short they were most important units in combating disease, and it was on the Italian front particularly in my own experience, that we found them of very great value.

NOTIFICATION OF INFECTIOUS DISEASE.

All cases of infectious or communicable disease were notified at once by the Medical Officer in charge to the principal administrative medical officer of the formation concerned.

Following that this pro forma was filled up in all cases and dispatched as soon as possible.

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ALL INFECTIOUS DISEASES.

1. Disease .....

Name ..... Rank ..... No. .... Age...

Unit ..... Coy. ..... Platoon .....

Division ..... Corps .....

2. Date of Arrival in Country .....

3. Date reporting sick .....

4. Place reporting sick .....

5. Probable place of Infection .....

6. Suspected source of Infection .....

(e.g. Milk, water, flies, carriers, prevalence of sickness among civilians, etc.)

7. Date last inoculated T.A.B. ..... Evidence ..... (Documentary or verbal)

Remarks .....

(Description and map reference of billet last occupied etc.)

.....

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Signature .....

Date .....

M.O. i/c. .....

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As mentioned above, one Field Ambulance, or more usually a section of Field Ambulance, was set aside for the reception of such cases; also a special C.C.S. and a special Base Hospital or portions thereof.

Almost immediately on our arrival in Italy, it became obvious that in view of the congested state of the Zona di Guerra, packed as it was with refugees and troops (Italian, French and British) in addition to approximately its own normal population, some system of inter-notification of infectious disease was essential. More particularly did we consider this so with regard to the civilian population, inasmuch as diseases of the Enteric group and Dysentery are endemic in North Italy.

Accordingly a comparatively complete system of inter-notification was instituted between ourselves and the Italian and French troops and also the civilians. I say 'comparatively' advisedly because, owing to the backward state of education in matters of hygiene and sanitation among the civilian population of North Italy, and also one must admit partly due to the paucity of civilian medical practitioners, there is no doubt whatever that the figures I shall quote later for the Italian civilian population are a gross underestimate.

However, be that as it may, the figures are as complete as it was possible to obtain, and that they are even so complete is a tribute to the harmonious working of the Allies in the field of preventive medicine.

Twice or thrice a week we received from the Italian medical/

medical authorities bulletins giving name, age, address and diagnosis of all cases of notifiable disease in the Province. These bulletins were immediately rapidly duplicated and copies were sent to all administrative medical officers of formations and to all officers commanding Sanitary Sections. The Officers commanding Sanitary Sections at once visited all cases in their particular area and sent in reports on each case stating the proximity of British troops to the infected house, etc.

Naturally a considerable proportion of the cases among civilians were not likely to affect our troops, but all cases in our billeting areas were gone into carefully and every effort was made to discover the source of infection.

As Italian civilian hospital accommodation was greatly over-taxed and often non-existent, and because their education in sanitary standards was not always quite as advanced as ours, one could not always ensure removal of the danger focus to hospital: but what pressure one could command was brought to bear in trying to obtain hospitalisation.

When the patient had any connection with a shop or with the sale of milk, fruit, sweets etc., the premises were at once declared "Out of Bounds to all British Troops" - a large supply of printed tickets being issued to Sanitary Sections for the purpose of affixing/

affixing to the premises and its approaches. If British Troops were billeted on the premises they were of course at once given accommodation elsewhere.

In short, every possible step was taken to prevent as far as possible the infection of our Troops from such civilian foci.

The figures which follow will, I think, demonstrate how admirably and efficiently wise and watchful administration prevented the spread of disease under conditions which were well-nigh ideal for rapid dissemination of infection.

ANALYSIS OF STATISTICS.

I propose to take up each disease separately as far as possible - prefacing any remarks made on the condition as applicable to our Troops by a table or tables showing the relative incidence of such condition on the Allied Troops and the civilians in the area.

But before proceeding to take up each disease separately, I append tables showing for each month the incidence of all notifiable diseases in the various formations under review, viz.-

Table I./

Table I. Infectious Diseases - Admissions - British Force in Italy Forward Area.

Table II. Infectious Diseases - Admissions - British Zone in Italy Base and L. of C.

Table III. Infectious Diseases - Admissions - Taranto.

Table IV. Infectious Diseases - Admissions - Sixth Italian Army.

Table V. Infectious Diseases - Admissions - French Army in Italy.

Table VI. Infectious Diseases - Notifications - Province of Vicenza.

Table VII. Infectious Diseases - Notifications - Kingdom of Italy.

The most complete figures are, naturally, those of our own Army. Some of the conditions are either not notifiable in the other formations concerned in this survey, or else, if notifiable, were not procurable.

TABLE I.

BRITISH FORCE IN ITALY : FORWARD AREA.

INFECTIOUS DISEASES - ADMISSIONS DEC. 1917 - DEC. 1918 (INCLUSIVE).

	1917. Dec.	1918. Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Totals
Average Strength	102,183	113,759	113,233	93,050	71,193	71,642	68,707	67,547	67,500	65,286	63,284	62,623	60,192	78,477 (Mean)
Measles	6	5	8	5	2	0	0	0	1	0	0	0	0	27
Rubella	0	0	4	6	4	8	0	1	0	1	0	0	1	25
Chickenpox	0	0	1	0	0	0	0	0	0	0	0	0	0	1
Smallpox	0	0	0	0	1	0	0	0	0	0	0	0	0	1
Cerebro-Spinal Fever	0	0	4	0	0	2	0	0	0	0	0	0	0	6
Typhus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mumps	4	15	9	18	17	17	9	7	3	2	1	3	6	111
Malaria (Primary)	0	0	0	0	0	1	0	0	6	10	7	11	2	37
Malaria (Recurrent)	2	4	4	2	0	9	10	5	10	3	2	0	0	51
Anthrax	0	0	0	0	0	2	0	0	0	0	0	0	0	2
Erysipelas	1	3	4	2	1	0	0	2	0	4	1	0	3	21
Tetanus	0	1	0	0	0	0	0	0	0	0	0	2	0	3
Trachoma	0	0	0	0	1	0	0	0	0	0	0	0	0	1
Malta Fever	0	0	0	1	0	0	0	0	0	0	0	0	0	1
Spirochaetosis Ictero-Haemorrhagica	0	0	0	0	0	0	0	0	0	1	0	0	0	1
Diphtheria	4	12	18	11	15	10	3	30	20	5	6	3	4	141
Scarlatina	7	22	9	7	5	3	1	2	2	0	0	0	0	58
Typhoid Group	0	21	14	5	1	6	5	5	10	31	18	2	16	134
Dysentery	3	7	5	7	1	2	9	63	256	321	150	28	7	859
Influenza	100	40	19	102	2	193	4553	145	131	338	3547	1730	614	11,514
Tuberculosis (Pulmonary)	6	16	9	7	7	5	10	4	2	4	6	3	2	81
Pneumonia	25	32	19	22	8	13	17	4	5	3	13	10	2	173

TABLE II.

BRITISH FORCE IN ITALY - BASE & L. of C. (TARANTO Excluded)

INFECTIOUS DISEASE - ADMISSIONS DEC. 1917 - DEC. 1918 (Inclusive)

	1917 Dec.	1918 Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Totals.
Average Strength	13,389	14,510	14,387	18,135	15,886	12,551	16,008	17,087	17,269	20,738	20,696	24,836	26,025	17,809 (Mean)
Measles	0	1	1	9	2	1	0	1	0	1	0	0	1	17
Rubella	0	3	5	0	3	1	0	0	0	0	0	0	0	12
Chickenpox	0	0	0	0	0	0	0	0	0	0	0	0	0	-
Smallpox	0	1	0	0	0	0	0	0	0	0	0	0	0	1
Cerebro-Spinal Fever	0	0	0	0	0	0	0	0	0	1	0	0	0	1
Typhus	0	0	0	0	0	0	0	0	0	0	0	0	0	-
Mumps	0	1	1	5	2	1	1	0	0	1	1	0	1	14
Malaria (Primary	0	0	0	0	2	1	1	0	7	5	2	4	0	22
Malaria (Recurrent	3	11	5	10	26	24	38	20	13	6	8	3	2	169
Anthrax	0	0	0	0	0	0	0	0	0	0	0	0	0	-
Erysipelas	0	1	0	0	0	0	0	0	1	0	0	0	0	2
Tetanus	0	0	0	0	0	0	0	0	0	0	0	0	0	-
Trachoma	0	0	0	0	0	0	0	0	0	0	0	0	0	-
Malta Fever	0	0	0	0	0	0	0	0	0	0	0	0	0	-
Spirochaetosis Ictero-Haemorrhagica	0	0	0	0	0	0	0	0	0	0	0	0	0	-
Diphtheria	0	1	1	1	2	0	0	0	0	1	3	3	1	13
Scarlatina	0	2	2	1	3	0	1	0	3	0	1	2	0	15
Typhoid Group	2	1	0	0	0	0	0	0	1	2	0	0	2	8
Dysentery	1	1	0	2	0	0	2	6	8	10	5	6	1	42
Influenza	-	-	-	-	-	-	-	-	-	2348	1882	921	423	5574
Tuberculosis (Pulmonary)	0	3	0	3	3	4	1	2	3	3	3	2	0	27
Pneumonia	3	3	3	2	0	4	1	3	0	8	27	2	0	56

TABLE III.

BRITISH FORCE IN ITALY : TARANTO (Mediterranean L. of C.)

INFECTIOUS DISEASES : ADMISSIONS DEC. 1917 - DEC. 1918 (Inclusive)

	1917	1918												
	Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Totals.
Average Strength	Not known as Taranto was a staging camp for troop to and from the East.													
Measles	11	69	17	43	4	0	0	1	1	0	0	7	0	153
Rubella	0	0	1	0	8	1	0	0	0	0	0	1	1	12
Chickenpox	0	1	1	1	9	9	7	9	4	4	6	2	0	53
Smallpox	0	0	0	0	0	0	0	0	0	0	0	0	0	-
Cerebro-Spinal Fever	0	1	4	1	0	0	0	0	0	0	1	0	0	7
Typhus	0	0	0	0	0	0	0	0	0	0	0	0	0	-
Mumps	6	14	30	49	45	19	14	7	5	53	72	7	5	326
Malaria Primary	0	0	0	0	0	0	4	7	18	11	11	6	3	60
Malaria Recurrent	7	30	61	59	37	106	83	143	99	102	71	74	34	906
Anthrax	0	0	0	0	0	0	0	0	0	0	1	0	0	1
Erysipelas	0	0	1	2	1	1	0	0	0	0	0	0	0	5
Tetanus	0	0	0	0	0	0	0	0	0	0	0	0	0	-
Trachoma	0	0	1	0	0	1	0	0	1	1	1	0	0	5
Malta Fever	1	0	0	0	0	0	1	0	0	0	1	0	0	3
Spirochaetosis Ictero-Haemorrhagica	0	0	0	0	0	0	0	0	0	0	0	0	0	-
Diphtheria	0	0	0	0	1	1	1	1	0	0	4	1	1	10
Scarlatina	0	1	2	0	0	0	0	1	0	0	0	0	0	4
Typhoid Group	0	0	2	2	0	0	2	7	0	3	11	6	1	34
Dysentery	1	4	2	2	0	4	11	20	13	22	33	28	8	148
Influenza														
Tuberculosis (Pulmonary)	1	0	2	2	6	2	1	8	11	4	8	5	10	60
Pneumonia	0	39	39	10	4	9	0	5	7	5	12	7	9	146

TABLE IV.

SIXTH ITALIAN ARMY (ASIAGO FRONT)
(Excluding the Attached French and British Troops)

INFECTIOUS DISEASES (Diagnosis Confirmed) : ADMISSIONS APRIL - DEC. 1918 (Inclusive)

	1917 Dec.	1918 Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Totals.
Average Strength	-	-	-	-	195,000	204,115	196,141	204,951	203,074	204,926	199,996	214,292	190,000	201,389 (Mean)
Measles					13	31	14	2	4	1	4	4	3	76
Rubella						Not	Notifiable in Italian Army.							
Chickenpox					0	0	1	1	0	1	2	0	4	9
Smallpox					9	0	3	0	0	4	0	0	0	16
Cerebro-Spinal Fever					7	4	0	1	2	0	0	0	1	15
Typhus					0	0	0	0	0	0	0	0	0	-
Mumps					50	73	26	14	13	9	2	13	22	222
Malaria Primary					1	2	1	147	94	117	24	0	1	387
Malaria Recurrent					83	160	94	298	246	236	109	82	4	1312
Anthrax					0	1	0	0	0	0	0	1	0	2
Erysipelas					25	30	6	4	2	6	1	2	15	91
Tetanus					0	1	0	0	0	2	1	3	1	8
Trachoma					6	1	5	4	7	12	6	5	10	56
Malta Fever					0	0	0	0	0	0	0	0	0	-
Spirochaetosis Ictero-Haemorrhagica					0	0	0	0	0	0	0	0	0	-
Diphtheria					0	2	1	2	2	0	1	1	0	9
Scarlatina					3	1	2	1	1	3	2	2	2	17
Typhoid Group					38	51	37	44	113	120	25	32	24	484
Dysentery					3	5	17	60	454	518	100	25	7	1189
Influenza					0	8847	3498	120	450	1541	7080	2444	1789	25,769
Tuberculosis (Pulmonary)					15	16	16	21	18	20	14	12	7	139
Pneumonia						Not	Notifiable in Italian Army.							

TABLE V.

FRENCH ARMY IN ITALY - ASIAGO FRONT.

INFECTIOUS DISEASES : ADMISSIONS APRIL - DECEMBER 1918 (Inclusive)

	1917 Dec.	1918 Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Totals
Average Strength			Approximately		48,000		(Two	Infantry	Divisions		+ Corps	Troops)		
Measles					6	3	3	1	0	3	0	0	0	16
Rubella														
Chickenpox														
Smallpox														
Cerebro-Spinal Fever														
Typhus														
Mumps					68	42	24	6	9	33	25	5	17	229
Malaria Primary					0	0	0	0	17	29	3	0	1	50
Malaria Recurrent					12	15	10	20	38	22	3	2	3	125
Anthrax														
Erysipelas														
Tetanus														
Malta Fever														
Spirochaetosis Ictero-Haemorrhagica														
Diphtheria					11	5	3	0	1	0	3	2	1	26
Scarlatina					4	3	1	1	1	1	0	1	0	12
Typhoid Group					5	3	1	5	17	7	1	6	2	47
Dysentery														
Influenza						393	394	4	96	756	1601	431	473	4148
Tuberculosis Pulmonary														
Pneumonia														

TABLE VI.

PROVINCE OF VICENZA : KINGDOM OF ITALY.
Local Notifications of Infectious Disease among Civilians.

POPULATION: Estimated number of Inhabitants remaining 460,000: Refugees 40,000. TOTAL - 500,000.

	1917 Dec.	1918 Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Totals	Jan. 1919
		Estimated Total Population = 500,000													
Measles		111	73	80	134	143	108	105	42	13	9	0	2	820	17
Rubella															
Chickenpox															
Smallpox		16	14	32	21	5	3	0	0	0	0	0	0	91	0
Cerebro-Spinal Fever		0	0	0	0	0	0	0	0	0	0	0	0		0
Typhus		0	0	0	0	0	0	0	0	0	0	0	0		0
Mumps															
Malaria											*				
Anthrax															
Erysipelas															
Tetanus															
Trachoma															
Malta Fever															
Spirochaetosis Ictero-Haemorrhagica															
Diphtheria & Croup		65	102	74	53	35	27	38	57	56	42	15	20	584	22
Scarlatina		16	9	10	8	19	10	7	3	22	3	0	0	107	0
Typhoid Group		13	22	9	11	24	31	123	574	523	110	13	9	1462	3
Dysentery		0	0	1	0	2	12	68	155	86	5	1	0	330	0
Influenza *											33,554	10,592	2,915	47,061	
Tuberculosis (Pulmonary)															
Pneumonia															

* Notification of Influenza obligatory from October.

TABLE VII.

KINGDOM OF ITALY.

NOTIFICATIONS OF INFECTIOUS DISEASE : 1918.

ESTIMATED POPULATION - 35 MILLIONS (Approximately)

	1917	1918												
	Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	
Measles		3197	4945	7765	8106	9036	11658	7369	4199	3197	1434	794	1116	62,816
Rubella														
Chickenpox		508	491	499	308	289	248	147	130	220	103	249	888	4,080
Smallpox														
Cerebro-Spinal Fever		155	222	315	249	285	174	77	50	28	18	10	35	1,618
Typhus		0	0	2	1	12	14	0	2	0	0	0	0	31
Mumps														
Malaria														
Anthrax														
Erysipelas														
Tetanus														
Trachoma														
Malta Fever														
Spirochaetosis Ictero-Haemorrhagica														
Diphtheria & Croup		1674	2142	2121	1403	1246	1348	959	1278	2084	1215	891	949	17,310
Scarlatina		752	700	807	718	782	877	567	554	840	406	254	344	7,601
Typhoid Group		1359	994	1098	1176	1378	1890	2607	7271	10,717	3064	1268	823	33,705
Dysentery		61	45	17	15	36	314	1356	4390	5608	1574	144	88	13,648

DIARRHOEAL DISEASES.

The chief cause for anxiety as regards the health of the British Troops in Italy during 1918 - particularly during the summer and autumn - was the prevalence of infectious disease of the bowel, e.g. typhoid, dysentery and diarrhoea, especially in the civilian population of the Province of Vicenza, amongst whom this form of disease is considered to be endemic - a fact not very surprising in view of the comparatively low standard of hygiene prevailing there, and the inadequacy of local civilian medical arrangements for coping with the condition; an inadequacy which was enhanced during the period under review, as has already been indicated, by the war conditions prevailing and the concomitant overcrowding.

From the tables which follow, one sees that the incidence of Typhoid Fever was three times as great in the Province of Vicenza at this time as in the rest of the Kingdom of Italy; while Dysentery was twice as prevalent.

When one takes into account the fact that special hospitals for the isolation and treatment of these diseases among the civilian population only came into being during September 1918, and even then only on our urgent representations to the Italian authorities pointing/

pointing out their necessity, it will be seen that the danger to our troops was very grave.

During this period, we never ceased to impress on all our troops the necessity for efficient inoculation and re-inoculation as our main line of defence against a possibly crippling outbreak; and the results of our campaign, which appear in one of the tables later, show with what success our measures were attended.

NOMENCLATURE.

It is necessary here to refer to a great difficulty, from the administrative point of view, with regard to terminology as applied to clinical conditions.

During the early days of the Dysentery epidemic in Italy, comparison of the statistics of the French and Italian Troops in the VIth Italian Army with our own revealed what seemed like a much greater incidence among the British Troops. But on investigation this disparity was found to be due to laxity in nomenclature.

For example, cases which were termed "Clinical Dysentery" by us were usually termed "Colitis" by the Italian civilian practitioners, who were, for the most part and for reasons already indicated, elderly/

elderly and overworked country practitioners. These so-called "Colitis" cases in large numbers - and one speaks from repeated personal observation - were never notified, and therefore one can only regard the figures given to show the prevalence of these diseases among civilians, as a gross under-estimate.

Much the same views were held as regards "Clinical Dysentery" in the Italian Army until the summer of 1918, and even in the French Army, while recognised by clinicians as "Diarrhoea Dysenteriforme", they appeared in French statistics under the heading of "Diarrhoea".

Again with regard to the Typhoid Group of diseases, these cases which were clinically Typhoid and classified by us as belonging to the "Enteric Group", in the absence of positive bacteriological findings, received various appellations among the Italians, and by the French were often called "Embarras Gastrique Febrile".

Repeated and urgent representations were made to our colleagues of both the French and Italian Armies urging the necessity of adopting some uniform system of nomenclature if inter-notification of Infectious Disease was to serve any useful purpose.

During the month of August 1918 both adopted the term "Clinical Dysentery" and moreover adopted much the same methods of dealing with Diarrhoeal Diseases as we did. The Italians further - but not the French - ultimately/

ultimately agreed to the appropriate use of the term "Enteric Group".

For these reasons alone, if for no others, I think we are entitled to consider that the figures with regard to Incidence and Mortality of Dysentery and the Typhoid Group of Diseases in both the French and Italian Armies are rather an under-statement of the case, as compared with our own.

The whole situation with regard to these diseases among British, French and Italian Troops of the VIth Italian Army during the summer of 1918 may be crystallised from the following statement:-

	BRITISH	FRENCH	ITALIAN.
TYPHOID GROUP.			
Incidence**	1.54	1.3*	3.2
Mortality	0.16	.14*	0.4
Method of Diagnosis) Clinical%	17	Nil*	3.7
Laboratory%	83	100*	96.3

* "Enteric Group" omitted.

DYSENTERY GROUP.			
Incidence	10.1	14.7	7.8
Mortality	0.199	0.11	0.26
Method of Diagnosis) Clinical%	52.3	94.1	83.8
Laboratory%	47.7	5.9	16.2

** N.B.- Incidence = Total Annual Incidence per 1000 Mean Average Strength.

DIARRHOEA AND ITS RELATION TO DYSENTERY.

In all theatres of war of which statistics are available, it would appear that outbreaks of Dysentery are frequently preceded or accompanied and usually followed by a rise in the incidence of Diarrhoea. And this was the sequence of events in Italy also.

Factors predisposing to diarrhoea are unavoidable incidentals to the rigours of campaigning, e.g. close contact of men, great physical exertion, rapidly alternating extremes of temperature with an absence of facilities for compensation, monotonous diet often of preserved food, and mechanical irritation of the alimentary mucosa by dust or sand. And all these factors likewise predispose to Dysentery.

Indeed from the practical and military point of view, in the present state of bacteriological knowledge and technique, it is probable that the number of cases of Diarrhoea is a far more important indication of a rise in Dysentery than are bacteriologically proved cases. In any case, from an epidemiological point of view, when occurring in a dysenteric area, all diarrhoeas should if possible be regarded as potential cases of Dysentery.

From the administrative point of view, it was found easier to investigate the epidemic by studying diarrhoea as a whole. Diarrhoea is a positive sign easy/

easy of determination, whereas the lapse of time necessary before a laboratory can report decisively is a factor which is apt to vitiate administrative measures which may be necessary, such as tracing and restricting movements of troops and investigating places and sources of infection.

EPIDEMIOLOGY OF DIARRHOEAL DISEASES.

1. Locality.

During the period of maximum incidence of Diarrhoea and Dysentery (June - September 1918), the British Troops formed part of the VIth Italian Army and were holding a line on the Asiago Plateau. Two Divisions were in the Line on the Plateau while one Division was in the Reserve Divisional Area on the Plain.

The summer of 1918 was not abnormally hot for an Italian summer, but for our troops it was distinctly trying in spite of the wearing of light khaki drill and sun helmets which were regulation during the summer.

The chief features were the exceeding dryness and concomitant dustiness of the Plains and the hot airless nights, while on the Plateau (which averaged roughly/

roughly 3000 - 4000 feet above sea level) it was much cooler during the day and often quite cold at night.

The change from Plateau to Plain during the hot weather was very considerable and, when one travelled by motor, was indeed dramatic as the hills rose almost sheer from the Plain and the road up was a purely military one constructed just before our arrival and in large part blasted out of the solid rock like a gigantic corkscrew. One could in a very short space of time pass from the comfortable airy warmth of the Plateau in a curving dusty descent of the hillside to the stifling airless heat of the parched and sun-baked plains where any vehicle at once raised a cloud of dust which hung about for long with never a breath of wind to dispel it.

The Divisions in Line on the Plateau then had these advantages over the Division in Reserve that (1) it was cooler both by day and by night, (2) it was destitute of civilians and (3) it was less dusty and not swarming with flies. To most of us these advantages more than outweighed the disadvantages of desultory shell-fire.

II. Seasonal Incidence and Weather Conditions.

From the Tables given the following points emerge:-

(1)/

(1) A rapid rise in the incidence of Diarrhoea during the first week in July, which was maintained at a high level till it fell again at the end of September. A return of high incidence of Diarrhoea in November.

(2) That Dysentery was at a maximum in September, while Diarrhoea with a maximum in July preceded it.

(3) That Dysentery subsided to a very low level by November, while Diarrhoea - though it subsided to a low level in October - rose again considerably in November.

As regards weather conditions it was noted that Rain seemed to cause a decrease in incidence while hot dry rainless spells caused an increase. Directly the really hot summer weather broke and it became cooler there was a gradual but steadily maintained decrease in incidence.

While dealing with climatic conditions one should record that it was invariably noted how relatively susceptible new arrivals (reinforcements, etc.) were to diarrhoea on entering the area.

III. Effects of Moves and Reliefs.

The following points clearly emerged on studying the problem.-

(1) That in the case of each Division the period it spent in the Line on the Plateau invariably showed a/

a much lower incidence than the time it was resting in the Reserve Divisional Area in the Plain.

(2) Each Division showed increases which were quite steeple-like, coinciding almost invariably with reliefs of Brigades in the Line; while in certain cases where the relief was more prolonged and spread out over 3 or 4 days, these increases were not so markedly steeple-like but less abrupt and more prolonged.

The important point is that these rises occurred usually 24 - 36 hours <u>after the relief</u>.

Now in military medical statistics rises during reliefs are very common: cases which have been "held up" by formations in the hope of a rapid return to health and duty are perforce evacuated to hospital when that formation has to become mobile. It will be readily understood then that before marching out there is always an increase of "petits malades".

But in the case under review the suggestion that these rises were due to "unloading" of cases held up in units despite regulations is totally discountenanced by the fact that the rise occurs <u>after</u> the completion of the relief and not during the beginning as is usually the case. Such rises might be explained by the increased exposure and fatigue/

fatigue that a relief entails during the march.

The ill-effect of residence in the plains as compased with the plateau is also shown by the fact that taking all three Divisions together the admissions for Diarrhoea averaged 17.88 per day in the plains as compared with 11.46 per day on the plateau.

Further evidence that movement of troops and changing areas affects the incidence of Diarrhoea seems to be discoverable in the fact already noted that, while Diarrhoea sank to a low level in October, it rose again sharply in November. This rise is I think directly traceable to the fact that towards the end of October the main portion of the British Force was moved secretly and by forced marches to the Piave front for the final attack. The resulting increase may be attributed to two factors.

(a) Change of Area. The probability is that there was a fresh infection in the district we occupied.

Furthermore in the rapid advance into reconquered territory on the other side of the Piave we found a great deal of diarrhoea among prisoners and civilians.

After the Armistice the whole Area was packed with starving Austrian prisoners, starving civilian refugees and starving Italian prisoners of war returning as best they could from the cages whose doors had been thrown open by the Austrians in their débâcle.

(b)/

(b) Nor can we altogether exclude as a causal factor in our increase of Diarrhoea in November the fatigue and hardships suffered by our own Troops during their victorious advance into a country which had been systematically devastated and despoiled by the Austrians.

IV. Places as Sources of Infection.

It was early noticed that certain spots appeared prone to form infective foci as was evidenced by a relatively higher incidence of diarrhoea in units marching into these areas.

The three worst places in the British area appeared to be Montecchio Maggiore, Arzignano and Cornedo, all of which were in the Reserve Divisional Area on the plain.

Here in tabular form is a record of the incidence of Diarrhoea in these three places.-

NUMBER OF CASES OF DIARRHOEA.

Division & Dates of Occupation.	'C' Division July 1 - July 18.		'B' Division July 24 - August 14.		'A' Division August 19 - September 4.		
Place.	Brigade.	No. of Cases.	Brigade.	No. of Cases.	Brigade.	No. of Cases.	Total.
Montecchio Maggiore	C1	156	B3	87	A1	78	321
Arzignano	C2	101	B1	74	A3	38	213
Cornedo.	C3	64	B2	65	A2	37	166

This table shows that each of the three Divisions occupying these places found that the Brigade (of 4 battalions) which occupied Montecchio Maggiore had the greatest incidence of Diarrhoea, and that, too, despite the fact that Montecchio Maggiore was a smaller place than Arzignano with fewer civilian inhabitants and fewer refugees.

As the incidence in Montecchio kept persistently higher it was thought that re-infection was carried on from Brigade to Brigade by the billets.
The place was divided into 4 areas - each representing a Battalion Billet - and the following figures show the result of an investigation into the figures of the respective battalion areas.

INCIDENCE OF DIARRHOEA IN MONTECCHIO MAGGIORE

Period: July - August 1918.

Area	'C' Division	No.of Cases	'B' Div.	Cases	'A' Div.	Cases	Total
1	W. Batt^{n}.	21	W. Batt^{n}.	4	W. Batt^{n}.	19	44
2	X. "	16	X. "	28	X. "	29	73
3	Y. "	43	Y. "	30	Y. "	8	81
4	Z. "	6	Z. "	24	Z. "	7	37

This table tends to show that Areas 2 and 3 were the worst but the evidence appears inconclusive and when on the spot one found it difficult to account for any disparity in incidence.

One possible factor which we stressed at the time, from the administrative point of view, and which existed in all three places, was that two main roads crossed in the villages - the roads were exceedingly dusty and the stream of army traffic both motor and horse-drawn was pretty continuous.

Following up these cases of Diarrhoea reported from Montecchio Maggiore - 49 out of the 235 reported from the 4 battalion billeting areas were returned as Dysentery, of which 30 were Shiga and the remaining 19 "Clinical Dysentery" without confirmatory laboratory evidence.

OTHER SUSPECTED FACTORS IN AETIOLOGY.

Flies.

While no definite bacteriological research on the influence of flies as carriers of the Diarrhoeal Diseases was carried out in Italy, all the evidence was in favour of condemning them here as in other theatres of war.

The number of flies became enormous directly the hot weather started - particularly in the Plain where, as has been shown, the diarrhoeal diseases were most prevalent. And it was in the villages particularly that they swarmed, as civilian sanitation was elementary or non est - and again it was in the villages that our troops got the greatest incidence of the disease.

I shall never forget going personally to inspect one particular house on the outskirts of such a village which was suspect. One case of 'colitis' had been reported from the house (a very small farm), in some of the out-buildings of which a few of our troops were billeted, and where butter, milk and fruit could be bought. I found in the house a young girl who was a perfect clinical specimen of Typhoid (the case reported to us) while close questioning elicited the

fact/

fact that two other children "upstairs" had been ill for a few days also - in a garret approached by a ladder I found them lying - also undoubted early Typhoids. I then enquired as to the methods of disposal of excreta and was taken outside and shown a central midden such as was the regulation in Flemish farms, on which, I was informed, the excreta were thrown - and from it the flies rose in dense buzzing clouds as I approached. Of course our troops were instantly posted elsewhere and all paths to the farm labelled conspicuously "Out of Bounds to all British Troops" but to us it was a continual marvel that the incidence of Typhoid kept so low among our troops.

Food.

Apart from the probable infection of food by flies, there seemed a considerable amount of evidence to show that quite a percentage of Diarrhoea among our Troops was due to over-indulgence in civilian fare on their relief from the trenches to the Rest area.

Thorough investigation revealed no one definite causal agent but on the whole we blamed fruit mostly: it was frequently cheap and it was difficult or impossible to prevent troops taking a surfeit of watermelon (often growing in stagnant and probably polluted swamps) unripe grapes (growing in profusion everywhere), apples/

apples and tomatoes.

At other times one could hardly avoid blaming our own rations for, in spite of the strictest supervision, "blown" tins of food-stuffs must occasionally get into circulation, and frozen meat in the heat of an Italian summer has not the same life as in more temperate climes.

Dust.

While it is extremely difficult to incriminate dust as a definitely causal factor in the production of dysentery and diarrhoea, there were circumstances present which seemed to bear out the theory that it was at anyrate a contributory aetiological factor.

Firstly the increase of diarrhoea during the very hot spells when the dust was one of our bug-bears tends to support the theory, and reference has already been made to the fact that the villages responsible for the greatest number of cases all contained dusty cross-roads disturbed by a practically continuous stream of traffic. And certainly when showers of rain laid the dust the incidence of diarrhoea diminished.

Further the observation was made that although troops of all branches of the service lived on the Plains, nearly 50 per cent of the dysentery cases occurring there were "Drivers" of motor or horsed vehicles/

vehicles who were particularly exposed to dust by reason of their duties. Indeed their faces were usually greyish-white with a thick layer of dust after a journey of any distance.

In one instance too it was thought that a Ration Dump - at the side of a main, much used, and very dusty road - which was imperfectly protected from dust, might be the cause of a relatively high diarrhoea rate among the troops who were supplied from it.

In any case from the administrative point of view attention was very decidedly paid to dust as a factor, and stringent orders were issued and enforced as regards adequate protection of Ration Dumps and food supplies generally.

Water.

Whereas in most other theatres of War the water supply was an ever present source of danger to the health of the Troops - in Italy there was very little cause for anxiety on that score.

In France and Belgium for example, and particularly the latter country, we were largely dependent on shallow wells often in close proximity to the central midden so invariably found at the small farms there, and consequently almost inevitably swarming with B. Coli and occasionally the more pathogenic organisms of the Coli-Typhoid group.

In/

In Italy on the contrary the quality of the water can only be termed excellent.

Most of the area in the Plains occupied by British Troops was supplied by a series of Artesian wells which emerge at a certain level from the mountain foot.

The Troops in line on the Plateau had, if anything, a better water supply from wells which gushed out at the foot of the mountains whence it was pumped up to the Plateau.

Even so, all water sources were carefully and periodically investigated and bacteriological examinations were frequently made, but in no case with any positive result as regards the finding of pathogenic organisms.

The water-carts of units were also tested frequently by the Water duty personnel of Sanitary Section and the further precaution was taken of still insisting on the usual chlorination of water, in force in other theatres of war, being carried out. This was considered advisable because, if once a unit got into the habit of dispensing with chlorination as a precautionary measure, the habit would not easily be resumed if at any time change of scene should make it indispensable.

During our stay in Italy only two incidents occurred where water could be blamed as a cause of diarrhoea.

(a)/

(a) In the case of a Soda-water factory which was started by the British Army where the water used for bottling was found to have a considerable B. Coli content. When this factory was moved to a new site on this discovery the incidence of diarrhoea in Messes supplied by it diminished.

(b) Several cases of severe diarrhoea at one time seemed traceable to the eating of water-cress and examination of the beds from which the cress was obtained showed definite pollution of the water.

Personal Cleanliness.

It was thought that the transmission of infection by hands was a distinct source of danger and as far as possible the necessity of washing before meals was impressed on the troops; more so as it has been shown by experiment that a considerable percentage of men soil their fingers during defaecation and micturition. They were also made to keep their eating and drinking utensils thoroughly clean.

In this connection unit cooks particularly came in for the strictest supervision both as regards their personal cleanliness and their cleanliness in cooking. Further they were of course invariably marked men in the event of suspicion falling on a "carrier" as the cause of a heavy incidence in any particular unit. In at least one instance in Italy a unit with an unduly high incidence of dysentery was found to have a cook/

cook who was a dysentery-carrier, he having had the disease a few months before on another front.

Of course it is hardly necessary to say that the greatest care was taken in declaring a patient free from infection before he returned to his unit. As a rule three separate bacteriological or cytological examinations at intervals were made after convalescence before the man was returned to duty. In the case of a man who was a cook, every endeavour was made to prevent him acting as a cook again even if he was found negative after Typhoid or Dysentery.

Civilian Sanitation and Overcrowding.

Enough has already been said to make it clear that this was a big and ever-present menace to our Troops.

Bacillary Dysentery and Typhoid are endemic in the area we occupied.

There was hopeless and inevitable over-crowding of civilians - inhabitants and refugees: all rules of hygiene were ignored by them and when disease did break out in a house only the worst cases or those with enough money were able to get any attention. Often indeed it was due to the exertions of our own medical officers that cases were discovered and diagnosed at all - urged on as they were not only by humanitarian/

humanitarian motives but with the view of having the danger to our own troops removed if possible.

The main point of this Thesis indeed is to attempt to show how successful administrative efforts in the British Forces in Italy were, in keeping the troops so comparatively immune from preventible epidemics in such a danger-laden environment.

TABLE VIII./

TABLE VIII. BRITISH FORCES IN ITALY : FORWARD AREA.

DIARRHOEA, DYSENTERY AND TYPHOID GROUP OF DISEASES.

Table showing Admissions, Deaths, Case-Mortality & Incidence
Period Dec. 1917 - Dec. 1918 (Inclusive)
Mean Average Strength 78,477.

Diseases.	Total Admissions	Total Deaths	Case Mortality %	Total Annual Incidence per 1000 Mean Average Strength.	
				Admissions	Mortality.
Clinical Dysentery	450	8	1.78	5.3	0.02
Amoebic "	9	1	11.1	0.1	0.01
Shiga "	272	8	2.94	3.2	0.09
Flexner "	76	Nil	Nil	0.89	Nil
"Y" "	52	Nil	Nil	0.61	Nil
Total Dysentery	859	17	1.97	10.1	0.199
Total Diarrhoea	3129	4	0.13	36.8	0.047
Total: Diarrhoea & Dysentery	3988	21	0.52	46.9	0.246
Enteric Group	22	2	9.1	0.26	0.02
Typhoid Fever	32	7	21.9	0.37	0.08
Paratyphoid "A"	22	1	4.5	0.26	0.01
Paratyphoid "B"	58	4	6.9	0.68	0.047
Total: Typhoid Group	134	14	10.4	1.57	0.16
Total: Diarrhoea & Dysentery & Typhoid Groups.	4122	35	0.85	48.5	0.41

TABLE IX.

SIXTH ITALIAN ARMY (ASIAGO FRONT)
(Excluding the attached French & British Troops)

DIARRHOEA, DYSENTERY AND TYPHOID GROUP OF DISEASES.
Table showing Admissions, Deaths, Case-Mortality & Incidence
Period:- April - December 1918 (Inclusive)
Mean Average Strength : 201,389.

Diseases.	Total Admissions	Total Deaths	Case Mortality %	Total Annual Incidence per 1000 Mean Average Strength.	
				Admissions	Mortality.
Clinical Dysentery	1007	30	2.8	6.7	0.19
Amoebic "	6	1	16.6	0.04	0.006
Shiga "	81	6	7.4	0.53	0.04
Flexner "	88	3	3.4	0.57	0.02
"Y" "	7	Nil	Nil	Nil	Nil
Total: Dysentery	1189	40	3.36	7.8	0.26
Total: Diarrhoea	4175	Nil	Nil	27.6	Nil
Total: Diarrhoea & Dysentery	5364*	40	0.74	35.4	0.26
Enteric Group	18	56	14.17	0.12	0.36
Typhoid Fever	377			2.49	
Paratyphoid "A"	46	2	4.3	0.29	0.013
Paratyphoid "B"	43	3	7.0	0.28	0.02
Total: Typhoid Group	484	61	12.63	3.2	0.4
Total: Diarrhoea & Dysentery & Typhoid Groups	5848	101	1.73	38.6	0.66

* Diarrhoea 77.9%
Dysentery 22.1%

DYSENTERY AND DIARRHOEA.

GENERAL CONSIDERATIONS.

Before attempting to analyse the available figures it is perhaps necessary to preface any conclusions by remarking what is generally conceded - that the bacteriological diagnosis of Dysentery during the War was unsatisfactory. Diarrhoea and Dysentery were responsible for a considerable proportion of the casualties on all fronts - more especially in tropical and sub-tropical climates. In Gallipoli, Salonika, Egypt, Mesopotamia, East Africa and even in Italy, France and Flanders epidemics of varying magnitude arose at different times and as a source of loss to fighting efficiency, practically supplanted the Enteric of former wars.

And yet in many of these epidemics bacteriological examination failed to be of any help at all - hence the necessity of considering Diarrhoea and Dysentery together as it was so often impossible to separate them, particularly when the cases occurred in huge numbers as was frequently the case, and so swamped the available bacteriological staffs. So much was this the case that for all practical purposes, during epidemic periods at any rate, the passage of blood and mucus was sufficient to authorize a temporary diagnosis of Clinical Dysentery with removal to the special/

special medical unit usually set aside for reception of such cases.

Perhaps the chief reason why bacteriology in this field was so impotent is because, to obtain positive results, rapid examination after onset of the initial symptoms is imperative.

Dorendorf and Kolle in examining 1000 stools containing mucus during an epidemic in Galicia were able to isolate B. Shiga only 6 times.

In the latter half of 1916 Schweriner (Berl. Klin. Wchnschr. 1918, 55) made an extensive investigation into the subject and was able to obtain a positive result in only 18 per cent of cases. He found that Dysentery bacilli are rapidly overgrown by saprophytes so that examination of stools becomes progressively negative as time goes on. Thus he found in

cases examined in first 4 days of disease 57% positive
" " from 4th to 12th " " " 28% "
" " after 12th day " " " 12% "

This bacterial overcrowding is favoured by heat and can be much retarded by packing specimens in ice. From our point of view we considered that by placing the bacteriologist actually at the special hospital for such cases we might obviate the difficulty to a certain extent, and this perhaps accounts for the relatively high percentage of laboratory diagnoses we were able to show.

PROCEDURE ADOPTED FOR DIAGNOSING DYSENTERY.

From the administrative point of view there were many difficulties in arranging for rapid segregation and observation of suspect cases.

Among troops generally, slight attacks of diarrhoea - so commonly incidental to the hardships of campaigning - are apt to be overlooked by both officers and men as not worthy of notice.

Furthermore individual medical officers in charge of troops had very varying views as to what constituted Dysentery, and lastly even the bacteriologists held conflicting views on the laboratory procedure, etc.

The orders issued by my Chief, the Director of Medical Services for Italy - Major-General Sir F.R. Newland, K.C.M.G., C.B., were as follows - and these orders were strictly enforced especially at epidemic periods.

(1) All cases of diarrhoea must be sent to Hospital. (In the case of troops in the Forward Area this 'Hospital' meant a Field Ambulance).

(2) All cases of diarrhoea that persisted longer than 48 hours in a Field Ambulance must be sent to the Special Casualty Clearing Station.

(Of/

(Of course any obvious case of Acute Clinical Dysentery was sent to C.C.S. without delay.)

(3) The laboratories attached to C.C.S. were to make one bacteriological examination of all such cases and further cytological examinations in all suspicious dysentery cases.

It was not until the initial period of the outbreak had passed that a definite scheme of pathological inquiry became standardised, as there were many divergencies of opinion as to the value and practicability of Bacillary Cytological and Serological diagnosis.

The D.M.S. finally issued the following orders on the subject.

Three examinations must be carried out, of all Dysentery cases requiring examination.

No.1 Exam^{n}. - The faeces to be examined both bacteriologically and cytologically as early as possible in the course of the illness.

No.2 Exam^{n}. - Cytological examination (to obtain evidence of ulceration of the intestine) to be made on the 3rd day following examination No.1.

No.3 Exam^{n}. Cytological examination of faeces on 5th day following examination No.2.

Examination/

Examinations No. 2 and 3 were dispensed with if a prior positive diagnosis were established.

The factors which prompted the institution of this procedure as a standard one, were firstly, that the chance of isolating and identifying the causal organism was so greatly diminished by the lapse of time that the number of positive cases obtained by such repeated examinations was not commensurate with the time, labour and expense of carrying out repeated examinations - of positive cases six-sevenths were isolated at the first examination where more than one was done. Secondly, cytological examinations revealing the presence or absence of ulceration yield far more valuable evidence of the progress of the disease from the military point of view.

LABORATORY METHODS.

I do not propose to deal with this aspect particularly, but would point out some factors which appear to me to somewhat vitiate the French and Italian statistics as compared with our own - or at any rate tend to show that our statistics are not lenient in comparison.

First as regards the figures given for Dysentery, it will be noted that while 47.7% of the British cases are/

are laboratory findings, only 5.9% of the French and 16.2% of the Italians are confirmed in the laboratory.

The methods of haemo culture appeared to be identical in all the Allied Armies, but in connection with the isolation and identification of pathogenic organisms from faeces, whereas the Italians employed mainly Endo's Medium, in our own laboratories Neutral Red Lactose Bile-salt Agar was mainly used for the first plating out process.

The French use for a similar purpose Neutral Red Lactose Agar, but omit the Bile-Salt, a circumstance which perhaps may have accounted for their lack of success as compared with ourselves.

Still further, the French laboratories were as a rule 8 miles or so away from the hospital and consequently the faeces as examined were not always fresh; whereas in our Army the laboratories were situated actually at the hospital set aside for the reception of Infectious Disease.

TABLE X./

TABLE X.

D Y S E N T E R Y.

	Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	
British Force in Italy. Forward Area. Mean strength 78477.	3	7	5	7	1	2	9	63	256	321	150	28	7	859
B.F. in Italy. Base & L. of C. Mean strength 17809	1	1	0	2	0	0	2	6	8	10	5	6	1	42
B.F. in Italy. Taranto.	1	4	2	2	0	4	11	20	13	22	33	28	8	148
VIth Italian Army Mean strength 201,889					3	5	17	60	454	518	100	25	7	1189
French Army in Italy. Mean strength 48,000					1	1	2	6	305	154	58	-	1	528
Province of Vicenza Population 500,000		0	0	1	0	2	12	68	155	86	5	1	0	330 (Total Annual Incidence = 66 per 100,000 of population.)
Kingdom of Italy. Population 35,000,000		61	45	17	15	36	314	1356	4390	5608	1574	144	88	13648 (Total Annual Incidence = 39.0 per 100,000 popul^{n}.

TABLE XI.

DIARRHOEA AND DYSENTERY.

Table showing Admissions, Deaths, Case Mortality and Incidence - 1918.

Diseases.	Total Admissions	Total Deaths	Case Mortality %	Total Annual Incidence. per 1000 Mean Average Strength.	
				Admissions.	Mortality.
BRITISH FORCE IN ITALY - FORWARD AREA - Mean Average Strength 78,477					
Clinical Dysentery	450	8	1.78	5.3	0.02
Amoebic "	9	1	11.1	0.1	0.01
Shiga "	272	8	2.94	3.2	0.09
Flexner "	76	Nil	Nil	0.89	Nil
"Y" "	52	Nil	Nil	0.61	Nil
Total Dysentery	859	17	1.97	10.1	0.199
Total Diarrhoea	3129	4	0.13	36.8	0.047
Total: Diarrhoea & Dysentery	3988	21	0.52	46.9	0.246
SIXTH ITALIAN ARMY - ASIAGO FRONT - Mean Average strength 201,389.					
Clinical Dysentery	1007	30	2.8	6.7	0.19
Amoebic "	6	1	16.6	0.04	0.006
Shiga "	81	6	7.4	0.53	0.04
Flexner "	88	3	3.4	0.57	0.02
"Y"	7	Nil	Nil	Nil	Nil
Total Dysentery	1189	40	3.36	7.8	0.26
Total Diarrhoea	4175	Nil	Nil	27.6	Nil
Total Diarrhoea & Dysentery	5364	40	0.74	35.4	0.26
FRENCH ARMY IN ITALY - Mean Average strength 48,000.					
Clinical Dysentery	497	i.e.	Diagnosed Clinically 94.1%		
Positive Dysentery (Laboratory Diagnosis)	31		" at Laboratory 5.9%		
Total Dysentery	528	4	0.76	14.7	0.11
Total Diarrhoea	641				
Total: Diarrhoea & Dysentery	1169				

TABLE XII.

INCIDENCE OF DYSENTERY.

BASE, L. of C. and TARANTO. - 1918.

BRITISH FORCE IN ITALY : BASE & L. of C. (Taranto Excluded. Mean Average Strength 17,809.

Month.		1917. Dec.	1918. Jan.	Feb.	Mar.	April	May	June	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Total.
DYSENTERY	Clinical	-	-	-	1	-	-	-	-	-	1	1	4	-	7
	Amoebic	1	1	-	1	-	-	-	3	-	3	-	-	-	9
	Shiga	0	0	-	-	-	-	2	2	5	3	2	2	-	16
	Flexner	0	0	-	-	-	-	-	1	1	2	2	-	-	6
	"Y"	0	0	-	-	-	-	-	-	2	1	-	-	1	4
Total Dysentery		1	1	-	2	-	-	2	6	8	10	5	6	1	42

BRITISH FORCE IN ITALY : TARANTO (Mediterranean L. of C.)

DYSENTERY	Clinical	-	3	1	2	-	-	5	-	1	2	1	-	1	16
	Amoebic	-	1	-	-	-	2	2	13	3	11	6	6	1	45
	Shiga	1	-	-	-	-	2	1	4	5	6	12	6	5	42
	Flexner	-	-	1	-	-	-	3	1	3	-	7	7	-	22
	"Y"	-	-	-	-	-	-	-	2	1	3	7	9	1	23
Total Dysentery		1	4	2	2	-	4	11	20	13	22	33	28	8	148

TABLE XIII.

BRITISH FORCES IN ITALY - FORWARD AREA.
Diagnosis, Incidence & Mortality of Diarrhoea & Dysentery : Dec. 1917 - Dec. 1918.

Period.		Total Admissions (to C.C.S)	Differential Diagnosis		Analysis of Dysentery Cases					Diagnosed	
		Diarrhoea & Dysentery	Diarrhoea	Dysentery	Clinical	Amoebic	Shiga	Flexner	Y	Clinically "Clinical Dysentery" %	At Laboratory %
Dec. 1917	Cases	214	211	3	3	-	-	-	-	100	0
Jan. 1918	Cases	177	170	7	4	-	-	2	1	57	43
Feb.	Cases	77	72	5	1	1	1	2	-	20	80
March	Cases	147	140	7	1	-	3	2	1	14	86
April	Cases	26	25	1	-	-	-	-	1	0	100
May	Cases	62	60	2	-	-	-	2	-	0	100
June	Cases	116	107	9	-	1	6	1	1	-	100
July	Cases	837	774	63	3	4	32	11	13	4.7	95.3
	Deaths	8	3	5	2	-	3	-	-		
Aug.	Cases	753	497	256	96	1	114	25	21	37.5	62.5
	Deaths	7	1	6	3	1	2	-	-		
Sept.	Cases	644	323	321	206	1	88	19	7	64.2	35.8
	Deaths	2	-	2	1	-	1	-	-		
Oct.	Cases	359	209	150	109	1	25	9	6	73.3	26.7
	Deaths	4	-	4	2	-	2	-	-		
Nov.	Cases	513	485	28	24	-	2	2	-	83	17
Dec.	Cases	63	56	7	3	1	1	1	1	43	57
Total Cases		3988	3129	859	450	9	272	76	52	52.3	47.7
Total Deaths		21	4	17	8	1	8	-	-		
Case Mortality %		0.52	0.13	1.97	1.78	-	2.94	-	-		

ANALYSIS OF STATISTICS.

Table X

shows the monthly incidence of Dysentery in the British, French and Italian troops.

Table XI

shows Admissions, Deaths, Case Mortality and relative incidence of Diarrhoea and Dysentery in British, French and Italian troops of the VIth Army.

Table XII

shows relative incidence per month of the types of Dysentery for the Base, L. of C. and Taranto.

Table XIII

shows Diagnosis, Incidence and Mortality of Diarrhoea and Dysentery in the British Force (Forward Area).

As regards the actual numbers, it will be seen that the epidemic caused 859 casualties in the forward area - the French and Italian Army figures roughly correspond in ratio.

It will be noted that the important rise in numbers in all three Armies started in July and lasted till October with the maximum falling in August. This rise was preceded by a considerable increase of Diarrhoea in June.

As regards the percentage of Dysentery to Diarrhoea/

Diarrhoea, the French show the highest percentage, - 528 cases of Dysentery out of 1169 cases of Diarrhoea and Dysentery. The British Force showed 859 cases of Dysentery out of a total of 3988 cases of Diarrhoea and Dysentery, and the Italian Army 1189 cases of Dysentery out of 5664 cases. Expressed in percentages that is

	Diarrhoea.	Dysentery.
French Army	34.9%	45.1%
British "	78.3%	21.7%
Italian "	80.0%	20.0%

The figures are summarised as follows:-

Incidence per 1000 mean average strength

			Method of Diagnosis.	
	Incidence.	Mortality	Clinical	Laboratory
British	10.1	0.199	52.3%	47.7%
French	14.7	0.11	94.1%	5.9%
Italian	7.8	0.26	83.8%	16.2%

The point one would draw particular attention to here, is the relatively high percentage of the British cases confirmed by the laboratories, to which attention was previously drawn.

As regards the Civilian Tables, it will be seen that Vicenza Province shows only 330 cases but that the/

the numbers per month correspond relatively to the Army figures except that the number in October is very small.

The figure 330 was in our opinion quite ludicrous and represented more approximately the mortality than the incidence. At any rate these figures only represent the worst cases which were sent to Hospital and exclude almost entirely those cases which from the epidemiological point of view were the most dangerous to us, namely those suffering from an attenuated form of the disease - and one can vouch from personal observation that they abounded in the neighbourhood. But the average civilian there seemed to regard this endemic condition as an annual event of comparatively little moment and it was undoubted that the vast majority escaped notification - and indeed usually medical attention - altogether.

BACILLARY AND AMOEBIC DYSENTERY.

The history of Dysentery indicates that it is usually the bacillary type which follows armies. It is essentially sudden in onset and attacks men obviously - in the trenches, on the march, or in camp. Amoebic dysentery is a more insidious condition and not/

not so rapidly recognised: formerly thought to be confined to the tropics and sub-tropics, it is now known to be widely spread throughout the temperate parts of Europe. For example Yakimoff (Bull. Soc. de path. exot. 1917. 10) arrived at the conclusion that amoebic dysentery does arise in Russia, e.g. Odessa, Transcaucasus, Astrakkan and Saratoff, apart from cases introduced into the country.

Martinez too (Arch. med. belges 1918. 71) determined its endemic existence in Spain.

But true to history it was the bacillary type which predominated in all Armies during the Great War.

It has been computed that roughly only 7% of all clinical dysenteries in the Eastern theatres of War were due to Entamoeba histolytica while in France and Flanders it played only a minor role and was responsible for only 2.8% of all cases.

Reference to Tables XI, XII and XIII show that in Italy in the Forward area the epidemic was almost entirely bacillary, there being only 9 cases of amoebic dysentery out of the 859 cases in the forward area.

Likewise in the VIth Italian Army there were only 6 cases of amoebic out of a total of 1189.

The figures for our Base and L. of C. show a further 9 cases of amoebic out of a total of only 42 cases/

cases of dysentery but the figures from Taranto, while small, are of interest as showing the tendency of dysentery to form epidemic patches.

The Taranto figures show.-

Clinical Dysentery		16
Amoebic	"	45
Shiga	"	42
Flexner	"	22
Y	"	23

i.e. 45 out of 148 were amoebic, i.e. 30.5%. relatively an exceedingly high incidence which is only comparable to the state of affairs in Mesopotamia where the amoebic rate was also very high.

THE TYPES AND PREVALENCE OF BACILLARY DYSENTERY.

As has been already stated, Bacillary Dysentery was the common form of the disease in all the Armies engaged, but the causal organism has been found to vary in different epidemics and on different fronts. The general concensus of opinion was that the more severe the epidemic, the greater the probability of the infection being due to Shiga. The Flexner group was much less toxic and the Y group still less so.

The tables given may be conveniently summarized thus:-

Italian VIth Army	Clinical	Shiga	Flexner	"Y"
Italian Troops	1007	81	88	7
Deaths	30	6	3	Nil
British Troops	441	268	70	50
Deaths	8	8	Nil	Nil

It appears from this summary then that among the British Troops at any rate Shiga predominated - the percentages being

Shiga 32.4%

Flexner 8.5%

"Y" 5.9%

And this is probably a fairly correct statement of the actual facts, viz. practically 4 of Shiga to 1 of Flexner.

The Italian figures show that in their troops Shiga and Flexner were almost equal, viz.

Flexner 7.4%

Shiga 6.8%

with indeed Flexner slightly preponderating.
The Italian statistics are however somewhat vitiated by reason of the relatively small proportion bacteriologically proved and a further source of error may have been in their bacteriological methods.

In any case it was generally considered that Shiga was the principal endemic dysentery of Northern Italy - a view corroborated by Ascoli (Presse méd. 1918).

Shiga/

Shiga was much the commonest type of infection in the East and was considered responsible for approximately 50% of all cases, while in France and Belgium it was not nearly so frequent and was held responsible in only some 15% of cases roughly - Flexner being the commonest type there and occasionally Y.

In the German Army according to Bischoff (Deutsche mil.-ärtzl. Ztschr. 1918. 47) epidemics of Dysentery before the war were usually confined to the "Y" bacillus but during the war both Shiga and Flexner appeared.

Kisskalt recorded a severe epidemic of Shiga on the Eastern front in the early months of the war.

Germany itself became heavily infected with Dysentery and in an epidemic in Prussia in 1917 there were 59,196 cases and 7,076 deaths, while an editorial note in the Medizinische Klinik (14) of 1918, referring to the prevalence of the disease in Germany, pointed out that in the second week of September 1918 there were 2020 cases with 229 deaths in Prussia alone.

Nolf Colard Dulière and Roskam in an account of Dysentery in the Belgian Army (Arch. méd. Belges. 1918. 71) noted that in 1915-16 the incidence was low, but from July to December of 1917 there was an epidemic which reached its acme from Mid September to Mid-October and died away again with the cold weather. Out of 1200 cases examined they found Shiga only 12 times - /

times - the remainder were Flexner or Y and again their experience corroborated that of elsewhere in that the mortality was accordingly low, only .25%.

Lancelin and Rideau too (Arch. de méd. et de phar. mil. 1918. 105) investigating an outbreak at Brest, found the majority of cases due to Flexner while the few that were due to Shiga were much more severe and more toxic. They, however, drew attention to the fact that Flexner tended to be more persistent and chronic - a fact which was subsequently verified in other theatres of war.

MORTALITY OF DYSENTERY.

The Case-Mortality of the various types and the mortality per 1000 mean average strength for the Italian and British troops in the forward area can be summarised thus from Table XI.

VIth Italian Army.

	British Troops.		Italian Troops	
	Case Mortality	Mortality per 1000	Case Mortality	Mortality per 1000
Clinical Dysentery	1.78	0.02	2.8	0.19
Amoebic	11.1	0.01	16.6	0.006
Shiga	2.94	0.09	7.4	0.04
Flexner	Nil	Nil	3.4	0.02
Y	Nil	Nil	Nil	Nil

These figures bear out generally what was the usual experience, viz., that discounting Amoebic Dysentery, the Shiga type of bacillary dysentery was invariably the most fatal - the Flexner less so, while the Y is invariably attended by a death rate which is practically negligible.

The only point to note is that the Case Mortality in the Italian troops was considerably higher for all types.

In other theatres of war the heaviest dysenteric death rate in British troops was probably in Gallipoli (a Shiga epidemic) where the Case Mortality was about 5% - in other theatres, even Eastern however, it rarely exceeded 2.7%.

Russ (Berl. Klin. Wchnschr. 1918. 55) states that in the Austrian Army on the Isonzo front the mortality was 5.7% for Shiga.

German authorities go further and while Neufeld regards a mild epidemic of Shiga as an impossibility, Jochman estimates its average mortality as high as 10% to 15%. In no theatre of war did out experiences corroborate that estimate.

In conclusion one would add that the importance of dysentery from the military point of view lies not so much in its lethal as in its crippling power. It spreads so rapidly, affects and incapacitates such large/

large numbers of men in such a comparatively short space of time, that, in the Summer and Autumn in an endemically dysenteric area it is a constant menace. Unfortunately too, a by no means negligible percentage of men affected are chronically incapacitated by it from a fighting point of view.

ENTERIC GROUP OF FEVERS.

GENERAL CONSIDERATIONS.

The Enteric group includes Typhoid Fever due to Bacillus Typhosus and the Paratyphoid Fevers due to Bacillus Paratyphosus A. or Bacillus Paratyphosus B.

At the beginning of the War there was some confusion as regards nomenclature but early in 1915 the general order was given that cases should be diagnosed "Enteric Group" on clinical grounds pending the laboratory differentiation into Typhoid, Para A. or Para B.

This group has in previous campaigns been probably the greatest scourge of armies and even in comparatively modern warfare it exacted a heavier toll than the weapons of the enemy.

In the South African War in which 557,653 British soldiers were employed, there were 59,750 cases of enteric with 8,227 deaths, i.e. an incidence of 285 with a death rate of 36 per 1000 average strength.

In the Spanish-American War out of 107,973 Americans there were 20,738 cases of enteric and 1,580 deaths.

In the Franco-Prussian war of 1870-1, according to Bruns (Zeitschr. f. med. beamte 1918. 31) there were 75,000 cases of Typhoid Fever in the Prussian Army of approximately one million men, whereas in 1914-15 there were only 20,000 cases out of a force estimated/

estimated as between six and seven millions.

The figures of the British Army during the Great War offer a striking contrast to the experience of previous campaigns - a contrast apparent indeed in the Armies of all the Powers engaged, who adopted modern prophylactic measures.

TABLE XIV./

TABLE XIV. TYPHOID GROUP.

	1917 Dec.	1918 Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	
British Force in Italy Forward Area Mean strength 78477	0	21	14	5	1	6	5	5	10	31	18	2	16	134
B. F. in Italy. Base & L. of C. Mean strength 17809	2	1	0	0	0	0	0	0	1	2	0	0	2	8
B. F. in Italy Taranto	0	0	2	2	0	0	2	7	0	3	11	6	1	34
VIth Italian Army Mean strength 201,389					38	51	37	44	113	120	25	32	24	484
French Army in Italy Mean strength 48,000					5	3	1	5	17	7	1	6	2	47
Province of Vicenza Population 500,000	-	13	22	9	11	24	31	123	574	523	110	13	9	1462
Kingdom of Italy Population 35,000,000	-	1359	994	1098	1176	1378	1890	2607	7271	10717	3064	1268	823	33,70

TOTAL INCIDENCE OF ENTERIC GROUP.

As will be seen from accompanying table (Table XIV) there were 134 cases in our forward area out of a mean strength of 78,477, i.e. an annual incidence of 1.54 per 1000 mean average strength.

The Base and L. of C. reported only 8 cases, while Taranto was responsible for 34.

The Sixth Italian Army for the 9 months of which statistics are available showed 484 cases, i.e. incidence of 3.2 per thousand.

The French Army reported only 47 cases giving an incidence of only .98 per 1000.

Perhaps the most interesting figures are those for the Province of Vicenza, which showed 1462 cases - an incidence of 2.924 per 1000, i.e. nearly double the British incidence; and it should be repeated again here, that there is not a shadow of doubt that only fairly obvious cases were reported at all - innumerable mild cases occurring as they did in a population where it is endemic, and occurring under the circumstances of chaos already outlined - were never reported at all. Indeed we thought it could be taken as fairly certain that the figures for the 6th Italian Army - viz. 3.2 per 1000 - were probably much lower, occurring as they did in a protected body of men but under/

under stricter medical supervision, than the actual incidence among the civilians of that Province.

Comparing these figures with those published from other forces and armies, one can only remark that while they show a state of affairs admittedly far from perfect, the wonder is that the incidence was not far higher.

In the British Armies generally, during the Great War, the enteric rate was nowhere over 10 per 1000 of strength except in Egypt during 1916 and in Mesopotamia in 1916 and 1917.

Macpherson (Medical History of the Great War) shows that in 53 months of War in France during which the ration strength rose from 269,711 to 2,528,400 the total admissions for enteric were 6,907 with only 260 deaths, while during more than 4 years and in six theatres of war with an average mean ration strength of approximately two million British troops there were in all only 20,149 cases of typhoid and paratyphoid with 1,191 deaths.

For the fact that these figures were so low we have to thank principally three measures - prophylactic inoculation, strict water control, and elimination of "carriers".

TABLE XV.

BRITISH FORCE IN ITALY: FORWARD AREA.
TYPHOID GROUP OF DISEASES : DEC. 1917 - DEC. 1918 (Inclusive)
Tables showing State of Protective Inoculation, Diagnosis, Incidence & Mortality.

Month.	Average Strength	State of Protective Inoculation With T.A.B. Vaccine.				Typhoid Group of Diseases.									
		Inoculated during month		Remaining Uninoculated during previous 12 months		Total Admissions		Analysis.							
								Diagnosed Clinically 17%		Diagnosed at Laboratory 83%					
								Enteric Group.		Typhoid Fever.		Paratyphoid "A"		Paratyphoid "B"	
		No.	%	No.	%	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases	Deaths
Dec. 1917	102,183	1,313	1.3	-	-	0	0	0	0	0	0	0	0	-	-
Jan. 1918	113,759	11,611	10.1	19,701	17.3	21	2	5	0	5	2	4	0	7	-
Feb.	113,233	10,793	9.7	10,732	9.5	14	2	4	1	4	1	3	0	3	-
March	93,050	7,569	8.1	6,172	6.6	5	0	0	0	0	0	4	0	1	-
April	71,193	2,655	3.7	5,491	7.7	1	0	0	0	0	0	0	0	1	-
May	71,642	3,535	4.9	5,581	7.7	6	0	0	0	5	0	0	0	1	-
June	68,707	3,237	4.7	5,814	8.4	5	2	0	0	4	2	0	0	1	-
July	67,547	5,111	7.4	6,404	9.4	5	1	2	1	0	0	1	0	2	-
Aug.	67,500	6,746	10.0	4,035	6.1	10	1	2	0	1	0	0	0	7	1
Sept.	65,286	3,525	5.3	2,570	3.9	31	3	5	0	5	1	0	0	21	2
Oct.	63,284	2,059	3.2	2,513	3.2	18	1	4	0	5	0	0	0	9	1
Nov.	63,623	547	0.9	2,806	4.4	2	0	0	0	1	0	0	0	1	-
Dec.	60,192	2,289	3.6	2,220	3.6	16	2	0	0	2	1	10	1	4	-
Total	Mean = 78,477	60,990	Average = 6.0		Average 7.9	134	14	22	2	32	7	22	1	58	4
				Case Mortality %			10.4		9.1		21.9		4.5		6.9

Total Annual Incidence per 1000 mean average strength = 1.54

Total Mortality " " " " " = 0.16

TABLE XVI.

SIXTH ITALIAN ARMY (ASIAGO FRONT).
(Excluding the attached French & British Troops)
TYPHOID GROUP OF DISEASES : APRIL - DECEMBER 1918 (Inclusive)
Tables showing Diagnosis, Incidence & Mortality.

Month.	Average Strength	A N A L Y S I S.									
		Total Admissions		Diagnosed Clinically (3.7%)		Diagnosed at Laboratory (96.3%)					
				Enteric Group		Typhoid Fever		Paratyphoid 'A'		Paratyphoid 'B'	
		Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases	Deaths
April	195,000	38	6	2	Deaths from Enteric Group are included among deaths from Typhoid Fever.	24	6	7	-	5	-
May	204,115	51	2	5		40	1	2	-	4	1
June	196,141	37	2	1		25	1	6	1	5	-
July	204,961	44	13	3		38	13	2	-	1	-
August	203,074	113	15	-		98	14	7	-	8	1
September	204,926	120	14	6		95	13	9	-	10	1
October	199,996	25	6	-		19	6	4	-	2	-
November	214,292	32	2	-		22	1	5	1	5	-
December	190,000	24	1	1		16	1	4	-	3	-
Totals	201,389 (Mean)	484	61	18		377	56	46	2	43	3
Case Mortality %			12.63		14.17		14.17		4.3		7.0

Total Annual Incidence per 1000 Mean Average Strength = 3.2

" " Mortality " " " " = 0.4

TABLE XVII. ENTERIC GROUP.

	VIth ITALIAN ARMY Average Strength 201,389		FRENCH ARMY IN ITALY. Average Strength 48,000		CIVILIANS PROVINCE of VICENZA. Estimated Population 500,000		CIVILIANS KINGDOM of ITALY Estimated Population 35 millions.	
	Admissions	Deaths	Admissions	Deaths	Admissions	Deaths	Admissions	Deaths
January	-	-	-	-	13		1359	
February	-	-	-	-	22		994	
March	-	-	-	-	9		1098	
April	38	6	5	-	11		1176	
May	51	2	3	-	24	NOT AVAILABLE	1378	NOT AVAILABLE.
June	37	2	1	2	31		1890	
July	44	13	5	-	123		2607	
August	113	15	17	-	574		7271	
September	120	14	7	-	523		10,717	
October	25	6	1	1	110		3064	
November	32	2	6	1	13		1268	
December	24	1	2	1	9		823	
Totals	484	61	47	5	1462		33,705	
Case Mortality %	12.63		10.6		Not Available		Not Available.	
Total Annual Incidence per 1000 mean average strength	3.2		0.98		2.924		0.963	

RELATIVE INCIDENCE OF TYPHOID AND PARATYPHOID.

Before referring to the tables it is necessary to point out once more that the value of statistics in diarrhoeal diseases is much vitiated by the large percentage of cases diagnosed clinically only, but as will be seen here the percentage of laboratory findings is higher than was often procurable.

TABLE XV

In the Forward Area out of the 134 cases, 112 or 83% were diagnosed bacteriologically and the results were:-

Typhoid	32
Paratyphoid A	22
Paratyphoid B	58

TABLE XVI.

The VIth Italian Army show 466 (96.3%) diagnosed at laboratory made up as follows:-

Typhoid	377
Paratyphoid A	46
Paratyphoid B	43

The French and Civilians were unfortunately unable to supply differential diagnoses with any certainty (Table XVIII).

The only point one can note, but cannot explain here, is the relatively large amount of Typhoid in the VIth/

VIth Italian Army as compared with Paratyphoid - a state of affairs which was rare even in their Army, and practically unknown in any of our Armies in any theatre of war.

In the B.E.F. France, for the whole war period, Typhoid was responsible for approximately one half of the cases while in Italy it was responsible for one third, and in other theatres of war among our troops the proportion was usually less than one quarter. In Italy as in France among our troops at anyrate Paratyphoid B was about three times as frequent as Paratyphoid A, while in Salonika, Egypt and Mesopotamia Para A was much the commoner infection.

At the outbreak of war Typhoid fever was endemic in every theatre: Paratyphoid B was very rare in England but fairly common on the continent, while Paratyphoid A was practically unknown except in the East and its sporadic occurrence in England and France was correlated by Galambos (Zeitschr. f. klin. med. 1917. 84) with colonial possessions.

Macpherson (History of the Great War) points out that, such being the case, typhoid would probably appear first in the B.E.F. France, closely followed by Paratyphoid B acquired locally, and that Paratyphoid A would be delayed until contact was established with troops who had served in the East or with French colonial/

colonial troops from Africa. And this is just what the sequence of events turned out to be.

Galambos likewise (loc. cit.) states that in the first year of war there were only a few cases of Paratyphoid A among German troops on the Western front: during the second year cases became more numerous, especially on the Eastern front, and by December 1916 he computed that it was responsible for 75% of cases in some epidemics. By 1918 Paratyphoid A was firmly established in the Central Empires and Lehmann (Münch. med. Wchnschr. 1917. 64) agrees with Galambos that its presence there was due to the large influx of black prisoners from Morocco via the French Army.

Müller (Münch. med. Wchnschr. 1918. 65) and likewise His (Berl. Klin. Wchnschr. 1918. 55) both drew attention to the fact that Paratyphoid Fever is much commoner than Typhoid at Constantinople, even in peace time.

At various times in 1916-17, epidemics of Paratyphoid A occurred on Eastern and S.E. fronts among the German troops, chiefly in Galicia, the Bukovina and Wolhynia. Epidemics also occurred in Serbia, Bulgaria and Macedonia.

In the Austrian Army too, Sternberg (Beitr. z. path. Anat. u. z. allg. Path. 1918. 64) reported a severe epidemic of Paratyphoid with a mortality of 4.2%/

4.2% for A type and 3.5% for B type.

Tschipeff and Fürst (Deutsch. med. Wchnschr. 1918. 44) described an epidemic of enteric among the civil population of the Dobrudsha with a preponderance of Paratyphoid A.

MORTALITY.

Reference to TABLES XV, XVI and XVII shows the Total Mortality to be .16 per 1000 and the Case Mortality for the Group to be 10.4%, made up as follows:-

Typhoid	21.9%
Para A	4.5%
Para B	6.9%

The VIth Italian Army shows a total mortality of 0.4 per 1000 and a Case Mortality for the Group of 12.63% made up as follows:-

Typhoid	14.17%
Para A	4.3%
Para B	7.0%

Again it is to be regretted that figures for an analysis of the other statistics are not available, but the Case Mortality among the French (10.6%) corresponds with ours.

While our figures compare quite favourably with those/

those of the Italian Army of which we formed a part, they are by no means good as compared with the British Armies in France in 1918. During the period under review the other theatres of war showed Case Mortalities as follows:-

France	5.9%	Case Mortality in British Troops for Enteric Group.
Salonika	4.44%	
Mesopotamia	10.9%	
Egypt	12.7%	
East Africa	28.4%	

The only explanation one can offer is the known tendency of the disease to be worse in hot climates, and that, combined with the sojourn in an area hopelessly overcrowded with a heavily infected population, seems to be the only cause for the relatively high death rate.

The relative mortalities of Para A and B appear to show that in Italy, at this period at anyrate, Para B was the more severe infection, but the general trend in other theatres of war, according to Macpherson, was for Paratyphoid A to be the more fatal.

PREVENTION./

PREVENTION.

In the introduction to Diarrhoeal Diseases, the general administrative measures of hygiene and sanitation enforced have been already touched on, but in dealing with the Enteric group one would like to refer more particularly to what was our main line of defence against this enemy - I refer to prophylactic inoculation.

As has already been stated, we never ceased to impress on all ranks the necessity of inoculation and re-inoculation, and in this connection it should be remembered that, though vaccination is obligatory in our Army, inoculation is not, while it was so in the Allied armies. The measure of success attained is demonstrated in TABLE XV, which shows that during the whole of 1918 inoculations or re-inoculations were being carried out at the rate of from over 10 thousand per mensem in January to over 2 thousand in December - during the year the percentage of men who had not been inoculated for 12 months fell from 17.3% in January to 3.6% in December.

The triple vaccine (brought in in 1915) was invariably used, containing 1000 million B Typhosus and 750 million each of Paratyphosus A and B. Two injections were given at an interval of 8 to 10 days - the first dose being 0.5 cc. and the second 1.0 cc. For re-inoculation a single dose of 1 cc. was given.

In/

In all theatres of war it was definitely proved that it lowers enormously not only the incidence but the morbidity.

TABLE XXIV

shows the state of inoculation of cases admitted from the Enteric group, viz. 67.4% of all cases admitted had been inoculated within the preceding 12 months and this group of men constituted as has been shown in

TABLE XV

an average of 92.1% of the whole force, while the 7.9% of the whole force who had not been inoculated for 12 months produced 32.5% of the admissions.

The experience of the British Armies was confirmed in all other Armies which adopted this measure.

Blum and Voisin (Ann. d'hyg. 1917. 28) showed that enteric fever in the French Army had undergone a complete modification since the beginning of war, inasmuch as the symptoms, while the same in kind, became much milder than they were before the war and during the first few months of hostilities. This change was the result of the influence of inoculation. At the outbreak of war the French troops were not protected and grave cases of enteric with high mortality occurred. But from the beginning of 1915, by which time inoculation had been carried out, the type of disease had changed and became much milder.

Musehold (Deutsch. mil.-ärtzl. Ztschr. 1918. 47) gives an article on anti-typhoid inoculation in the German Army based on his observations made from April 1915 on the Eastern front.

He found that in April, May and June 1915 enteric was fairly prevalent among the troops who were in a part of Poland where the disease was rife, and among those affected were a large number who had never been inoculated.

Inoculation was delayed, owing to military exigencies, until July. Admissions to hospital were as follows - 1.38 in April, 1.50 in May and 2.1 in June (per 1000). In July, after inoculation was carried out, the incidence dropped to .94 in August, .65 in September and .47 in December. Inoculation was again carried out in December and as a result there was a further drop to .28 in February and .05 in May (of 1916). There was a slight rise in July and August to .12 and .14 coincident with a prevalence of Dysentery. After further inoculation had been carried out in June, July and December 1916 and again in January and August of 1917 the enteric incidence in the Army decreased so much that from September 1917 the admissions for enteric were below the best peace-time figures.

He found the mortality in inoculated was 2.1% when inoculation had taken place in the previous six months, as compared with 10.1% when it was longer.

Hunerman/

Hunerman placed the mortality among uninoculated at 9.6% and so the Germans considered that re-inoculation should be six-monthly.

The Italian authorities in December 1915 came to the conclusion that owing to the absence of Paratyphoid A fever a bivalent vaccine against Typhoid and Paratyphoid B only was necessary: they also considered that a triple vaccine would cause too violent a reaction. Their idea was falsified and contact with other infected troops soon produced Paratyphoid A fever in their armies and the following excerpts bring out the point exceedingly clearly.

Galeotti and Bruno (Sperimentale Arch. di Biolog. 1917-18. 71) give a report on a series of 1,007 cases of suspected enteric in an Italian Army.

Of these 130 (i.e. 13%) were negative to all examinations,

While in 459 (or 46%) agglutination tests only were carried out and so are excluded,

this leaves 418 (or 41%) which were diagnosed bacteriologically as follows:-

Paratyphoid A	-	172 (or 41.1%)
Paratyphoid B	-	101 (or 24.2%)
Paratyphoid but doubtful	-	69 (or 16.5%)
Typhoid	-	76 (18.1%)

In this epidemic then Paratyphoid A predominated and they state that as their experience in this epidemic was corroborated by colleagues in other Armies it was obvious/

obvious that the predominance was due to the use of the bivalent vaccine. They also pointed out that Paratyphoid A and the undetermined paratyphoids were more frequent among the inoculated than among the uninoculated relatively.

Crossonini also in the same periodical (sperimentale. Arch. di Biolog.) reports on a further group of cases in the Gorizia sector from Dec. 1915 to Feb.1917 which made the point even clearer:-

Out of 944 suspected cases of enteric

441 were negative to all examinations

i.e. 503 positive cases - made up as follows

Typhoid 21%: Paratyphoid A 45%: Paratyphoid B 34%.

But these percentages were not constant throughout the period of investigation.

From Dec. 1915 to July 1916 - 208 cases

38% Typhoid
6% Paratyphoid A
56% Paratyphoid B

From Aug. 1916 to Feby. 1917 - 295 cases

9% Typhoid
73% Paratyphoid A
18% Paratyphoid B

This remarkable change in percentage incidence, whereby Paratyphoid A became responsible for 73% of the cases, is correlated with a re-inoculation of that Army carried out in the first half of 1916 by a bivalent vaccine against Typhoid and Paratyphoid B and a further investigation/

investigation by Crossonini of 458 cases produced the following facts:-

162 cases among men completely re-inoculated with the bivalent vaccine (3 injections) produced -

6% Typhoid
84% Paratyphoid A
9% Paratyphoid B

296 cases among non-inoculated or incompletely inoculated men produced -

28% Typhoid
25% Paratyphoid A
47% Paratyphoid B

So that in a body of men completely inoculated against Typhoid and Paratyphoid B, 84% of the cases of enteric group admitted were on account of Paratyphoid A - the one member of the group against which they were not protected: while in another body wholly or partly unprotected the incidence of all three members of the group was more nearly equal.

APPENDIX.

The Appendix to this Thesis is a tracing of an Italian official map of the Province of Vicenza subdivided into its communes, and has been drawn up as a "spot map" showing the monthly notifications of civilian cases of Enteric and Dysentery in each affected commune.

C H O L E R A.

GENERAL.

This particular member of the group of Diarrhoeal Diseases did not occur during the stay of the British Forces in Italy, although in 1916 it had caused considerable havoc in the Italian Army, there being over 14,000 cases with a mortality of 46%. The Italians became infected from the Austro-Hungarian Army, which had become affected primarily in Galicia in September 1914, and by September 1915 had had 26,000 cases with 15,000 deaths. The Austrian troops were also probably responsible for the great Serbian epidemic.

The British Armies, in spite of operating in many theatres of war where the disease was endemic, only became affected in Mesopotamia (2,852 cases) and Sinai (28 cases).

Prior to the last offensive the Austro-Hungarians made against our Asiago front in June 1918, we received reports from various sources - spies, prisoners and enemy deserters - that Cholera had by no means died out in the enemy armies and indeed that another outbreak was expected.

As we felt confident that the Austrians would probably have to attack our positions in conformity with the great German offensive then going on in France and/

and Flanders, we at once acted on this information with a view to examining all Austrian prisoners we might take, for latent cholera.

The steps we took were the construction of a large new prisoners' cage through which, orders were issued, all prisoners of war must pass.

The cage consisted of a large receiving yard divided into pens each capable of holding 20 prisoners or thereabouts, and another large yard - likewise subdivided into pens, from which the prisoners, after examination, could be distributed to the various prisoner-of-war camps. Between the receiving and distributing yards was a passage flanked by two covered in and suitably fitted-up laboratories, each capable of accomodating one or more bacteriologists with their staffs.

All prisoners were kept in the receiving yard until rectal swabs were taken and reported on, and only after being declared negative were they passed through to the distributing yard for disposal.

The enemy attack developed early on the morning of June 15th and after fighting all day and on the 16th our line was completely restored and the enemy definitely beaten. During this operation we captured 1,060 prisoners, all of whom were passed through the special cage described.

Although no cases of cholera were discovered, the/

the bacteriologists discovered quite a few cases of latent dysentery among these prisoners and so the elaborate precautions we adopted were not altogether without result.

TABLE XVIII.

M A L A R I A.

		Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	
British Force in Italy Forward Area.	Primary	0	0	0	0	0	1	0	0	6	10	7	11	2	37
Mean Strength 78,477	Recurrent	2	4	4	2	0	9	10	5	10	3	2	0	0	51
British Force in Italy Base & L. of C.	Prim.	0	0	0	0	2	1	1	0	7	5	2	4	0	22
Mean Strength 17,809	Recurr.	3	11	5	10	26	24	38	20	13	6	8	3	2	169
British Force in Italy Taranto.	Prim.							4	7	18	11	11	6	3	60
	Recurr.	7	30	61	59	37	106	83	143	99	102	71	74	34	906
VIth Italian Army	Prim.					1	2	1	147	94	117	24	0	1	387
Mean Strength 201,389	Recurr.					83	160	94	298	246	236	109	82	4	1312
French Army in Italy	Prim.									17	29	3	0	1	50
Mean Strength 48,000	Recurr.					12	15	10	20	38	22	3	2	3	125
Province of Vicenza					NOT		NOTIFIED.								
Kingdom of Italy					NOT		NOTIFIED.								

M A L A R I A.

INCIDENCE DURING THE GREAT WAR.

British Forces.

To realize the tremendously crippling effects of malaria on modern armies, one has only to look at the admission figures for this disease alone in the British Expeditionary Forces, scattered as they were to the four points of the compass.

In Macedonia the total admissions during 1916, 1917 and 1918 reached approximately 160,000: in Egypt about 35,000; in East Africa 107,000; and in Mesopotamia about 20,000, - according to MacPherson.

Other places such as the Cameroons, German S.W. Africa, France, Italy and even England itself, yielded their quota though in comparison the figures may be insignificant.

And that these figures, appalling as they may be, do not indicate the real number affected, appears to be borne out by the fact that in over 100 autopsies performed in Macedonia for deaths from Influenzal Broncho-pneumonia, 83% showed definite malarial pigmentation in the spleen without there being any active malaria.

Other Forces.

The other combatant powers experienced the same crippling/

crippling effects as did Britain, and the opinion expressed early in the war by Castellani (Archiv. méd. belges) that no disease would cause heavier losses was amply justified when statistics ultimately became available.

Tirelli (Gior. di med. mel. 1918. 66) states that from December 1915 to the end of March 1918, 239,556 cases of malaria occurred among the Allied Troops in Macedonia alone, of which 46.45% were among British Troops while 29.60% were among the French, 16.73% among Serbs and 7.15% among the Italians.

Malaria, which had been extinct for some time in Flanders, re-appeared as a consequence of the flooding of the country in the attempt to resist the German advance and thus recalled the disastrous Walcheren expedition of 1809.

In France and Germany too, and even in England, the return home of numerous men infected with malaria aroused much anxiety.

In Rumania malaria has long been endemic in the low-lying country round the Danube - the average pre-war number of Rumanians treated in hospital for malaria being about 7000 annually.

Regendanz (Archiv. f. Schiffs u. Tropen. Hyg. 1918. 22.) examined several hundred Rumanian children during a non-malarial part of the year (April - May) and found 1 to 2% were carriers. As a natural sequence, by/

by July Malaria was common among German troops operating there, though incidentally he mentions that there were no cases of Blackwater Fever in spite of quinine therapy.

In Bulgaria too Kayser-Peterson (Münch. med. Wchnschr. 1918. 65) reported on the prevalence of malaria - the German admission rate there rising from .17 to .8 per 1000 in the second year of war. But here Seyfarth (Berl. Klin. Wchnschr. 1918. 55) reported also Blackwater Fever.

In Turkey likewise Müller (Zentralbl. f. innere med. 1918. 39.) reported on its prevalence and His declared that it was the principal disease in that country. He also reports that in spite of the different climatic conditions prevailing, the time of its appearance among German troops in Flanders, Poland and the Balkans was the same.

German Army statistics for the first three years of war showed that malaria shared with cerebro-spinal fever the unenviable notoriety of being one of the only two diseases to show an increase - the incidence per 1000 rising from .16 in the first year of war to 4.2 in the third year. Russ, in discussing the prevalence of malaria among the Austrians on the Italian Isonzo Front, declared that the "mosquito-destroying detachments" could do very little as every shell-hole after rainfall became a breeding-ground for mosquitos.

Malaria in Italy.

The malaria problem in Italy, as far as our troops were concerned, presented itself in the forward area and the Taranto base chiefly, and on the L. of C. to a less extent.

Forward Area.

In the front line there was very little Malaria amongst British Troops and what little there was tended to occur, as will be seen from Table XVIII, at the latter end of the year when two divisions left the healthy Asiago Plateau and went down to the Piave to take part in the final assault.

In the forward area we had 37 cases of Primary and 51 cases of Recurrent Malaria for the year, as compared with the French figures of 50 and 125, and the VIth Italian Army figures of 387 and 1312. Civilian figures are not available as it is not a notifiable disease in Italy.

What might have happened, had our stay on the lower marshy reaches of the Piave been prolonged, it is difficult to say. A half-hearted attempt was made to institute quinine prophylaxis but the move was so rapid and the advance so lightning-like that it is very doubtful whether many units ever had a chance of getting any quinine at all - it was almost impossible to/

to get up bare rations, let alone anything else. But that the danger we were exposed to was very real, the malaria figures for the 3rd Italian Army on our right - operating in the delta of the Piave - show; they had 4,443 primary and 1,318 relapse cases.

L. of C.

On the lines of communication through Italy to Taranto it was proved that anopheles invaded the trains at many of the stopping places, but to what extent could not be gauged. Attempts were made to regulate the stopping-places and to mosquito-proof the trains, but both were found impracticable.

Taranto.

At Taranto the troops exposed to infection, apart from troops passing through, numbered approximately 1,570 in 1917 and amongst these there were 220 cases of primary malaria. The infection rate was 14%. But in the case of one native labour company the rate rose to 35%.

Troops on their way to Egypt and Salonika were usually put up at Taranto camp for a varying number of days and complaints soon arose that malaria infection was taking place there. As a result rigid enquiries were instituted and a competent entomologist was detailed to collect anophelines, daily collections being made in two areas, one inside the camp and one/

one outside. The first week's collection showed 53 anophelines in the camp and 531 in the outer area. As a result of vigorous anti-mosquito measures adopted in 1918 and 1919 - mosquito-proofing, drainage and oil sprinkling - the numbers of anophelines collected gradually fell, until in 1919, so free did the camp become, that the prophylactic use of quinine and the use of mosquito-nets were discontinued.

The prevalent mosquito was A. Maculipennis which came chiefly from ditches and marshes to the south and east of the camp, while A. Bifurcatus was found to the west and bred in troughs and wells principally.

Appendix.

The Appendix to this Thesis is an official map of the Province of Vicenza sub-divided into its communes and showing in addition to the Enteric and Dysentery returns, the malarial zones of the province.

TABLE XIX. CEREBRO-SPINAL FEVER.

	Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	
British Force in Italy Forward Area. Mean Strength 78,477	0	0	4	0	0	2	0	0	0	0	0	0	0	6
British Force in Italy Base & L. of C. (Taranto excluded) Mean Strength 17,809	0	0	0	0	0	0	0	0	0	1	0	0	0	1
British Force in Italy (Taranto)	0	1	4	1	0	0	0	0	0	0	1	0	0	7
VIth Italian Army (excluding British and French) Mean Strength 201,389	-	-	-	-	7	4	0	1	2	0	0	0	1	15
French Army in Italy Mean Strength 48,000	-	-	-	-	-	-	-	-	-	-	-	-	-	
Province of Vicenza Population 500,000	-	-	-	-	-	-	-	-	-	-	-	-	-	
Kingdom of Italy Population 35,000,000		155	222	315	249	285	174	77	50	28	18	10	35	1618

CEREBRO-SPINAL FEVER.

In view of the fact that from 1914 to 1918 this disease was epidemic among troops in the United Kingdom, while a concurrent heavy incidence affected the civil population - in view too of the fact that the incidence was known to be fairly heavy in Italy we kept a strict watch for Cerebro-Spinal fever in the British Forces in Italy.

But as the TABLE XIX shows, the incidence was comparatively light among our troops, the Forward Area showing only 6 cases for the year while our Base and L. of C. only reported one case. Taranto had 7 cases.

In the VIth Italian Army there were 15 cases but in the Province of Vicenza there were none at all - a state of affairs contrasting markedly with the figures for the whole Kingdom of Italy, viz. 1618.

Small as the figures from the war zone are, they show, as do the figures for the whole of Italy, a seasonal incidence exactly parallel with that noted in the United Kingdom where 77% of the cases occurred in the first 6 months of the year. From January the number of cases gradually increase till March when the maximum is reached, and from the end of June relatively few cases appear till December when the number rises again.

As/

As regards Aetiology most countries have been visited so climate does not appear to play any special role. Weather conditions, previous illness, and naso-pharyngeal catarrh have all been advanced as predisposing factors without much corroborative evidence to support such assumptions, and while Dopter considers that cold and fatigue predispose, this cannot be said to have been proved.

Only one factor seems to have been definitely proved as causative, namely, overcrowding, and Glover (M.R.C. London 1918 and Jl. of R.A.M.C. 1918. Vol.XXX) found that the carrier rate rarely exceeded 5% when a standard distance of one yard between beds was maintained in camps. With one foot four inches between beds the carrier rate rose to 10%: at one foot to 20% and at less than 9 inches to 28 or 30%. When the carrier rate rose to 20% or over, cases began to occur.

In the absence of records concerning Cerebro-spinal fever in previous wars in which the disease may have passed unrecognised, or possibly been confused with other conditions, Dopter's summary of its incidence in the French Army (Bull. Acad. de Med. 1918. 79) is of interest. He states that generally speaking it was not very common but there were

in 1915	-	1073	cases	or	4.2	per 10,000
1916	-	451	"	"	1.8	" "
1917	-	409	"	"	1.5	" "

He/

He considers that its power of spreading was low, probably due to open air life and freedom from close contact, and pointed out that it was not on the whole epidemic but that the cases tended to be widely separated with occasional small groups of 6 to 8 cases.

As regards the German Army, Galambos (Kriegsepidemiologische Erfahrungen 1917) says that though sporadic cases of cerebro-spinal fever occurred in all the theatres of war, it never assumed epidemic proportions anywhere.

In the Austrian Army, though figures of total incidence are not available, the mortality on the Isonzo front at any rate appears to have been high, viz.- 50% according to Russ (Berl. Klin. Wchnschr. 1918.55).

In the United Kingdom from 1914 to 1918 there were 4,238 cases among the military and 6,021 cases among the civil population with mortalities of 45.5% and 65.6% respectively.

In the British Expeditionary Force in France, where it first appeared in January 1915, there were from then till 1918 a total of 1583 cases with a mortality of 34%.

TABLE XX. TUBERCULOSIS - PULMONARY.

	Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	
British Force in Italy Forward Area. Mean strength 78,477.	6	16	9	7	7	5	10	4	2	4	6	3	2	81
British Force in Italy. Base & L. of C. Mean strength 17,809	0	3	0	3	3	4	1	2	3	3	3	2	0	27
British Force in Italy. Taranto.	1	0	2	2	6	2	1	8	11	4	8	5	10	60
VIth Italian Army Mean strength 201,389					15	16	16	21	18	20	14	12	7	139

NOT NOTIFIABLE IN FRENCH ARMY IN ITALY NOR AMONG CIVILIANS.

TABLE XXI. P N E U M O N I A.

British Force in Italy. Forward Area. Mean Strength 78,477	25	32	19	22	8	13	17	4	5	3	13	10	2	173
British Force in Italy Base & L. of C. Mean strength 17,809	3	3	3	2	0	4	1	3	0	8	27	2	0	56
British Force in Italy Taranto.	0	39	39	10	4	9	0	5	7	5	12	7	9	146

PNEUMONIA IS NOT NOTIFIED IN ITALIAN OR FRENCH ARMIES

NOR AMONG CIVILIAN POPULATION.

TUBERCULOSIS PULMONARY.

Reference to TABLE XX shows that this condition was responsible for an appreciable and fairly steady drain on the effectives of our troops, the greater incidence corresponding with the more trying weather prevailing at the beginning of the year.

No figures are available for the civilian population so that comparisons can hardly be drawn.

All the same the total numbers in both our and the Italian troops of the Sixth Army bear out the experience of both the French and German Armies which was that war caused a great increase in Tuberculosis. But while some authorities held that wounds and gassing markedly predisposed to Tuberculosis, others, and the majority indeed, held that there was no definite causal relationship, but that war conditions acted only indirectly by lighting up previous infections or debilitating the individual.

Grossberger (Münch. med. Wchnschr. 1917.64) records the cases of five soldiers who, though free from personal or family history of Tuberculosis, developed the pulmonary type fatally after prolonged suppuration from gunshot wounds of bone, and he compares the sequence with Tuberculosis following measles or whooping cough and regards it as the lighting up

of/

of a latent infection.

Sorgo also (Wien. med. Wchnschr. 1917. 77) defines "War Tuberculosis" as the activation of a previously latent infection or the acceleration of a Tuberculosis already active at the time of enlistment.

In Austria after the second year of war the increase of Tuberculosis among both civilians and military was very marked, Von Jaksch from his necropsies quoting an increase from 15% in 1915 to 32% in 1916 among the military, while Weichselbaum (Wien. med. Wchnschr. 1918. 68) states that among the civilian population of Vienna the deaths from Tuberculosis rose from 6,223 in 1914 to 9,551 in 1916, and remarks that that increase was general throughout Austria.
The same grave state of affairs emerged in Germany and Weber (Berl. Klin. Wchnschr. 1919. 56) showed that in Berlin alone 49.5% more people died of pulmonary and laryngeal tuberculosis in 1917 than in 1913 to 1916.

While the "blockade" doubtless affected the Central Empires more than it did the Allies, still the increase appears to have been general, as was indeed to be expected from the conditions under which the war was carried out.

Thus in Italy Ronzoni (Gior. di med. mil. 1917. 65) stated that, judging from the cuti-reaction, about 75% of soldiers have Tuberculosis but of those who give a positive reaction only about 20% showed clinical signs. He summarizes the position probably fairly accurately when he states that though war does not /

not create tuberculosis the term "war tuberculosis" may be used inasmuch as war reveals, intensifies and aggravates the disease.

P N E U M O N I A.

Reference to TABLE XXI shows that this also was a fairly constant drain on the troops - the maximum occurring here too in the first quarter as would be expected. As the condition is not notifiable in any of the other groups of human beings under consideration, no useful information appears deducible.

TABLE XXII.

D I P H T H E R I A.

	Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	
British Force in Italy Forward Area. Mean strength 78,477	4	12	18	11	15	10	3	30	20	5	6	3	4	141
British Force in Italy Base & L. of C. (Taranto excluded) Mean strength 17,809	0	1	1	1	2	0	0	0	0	1	3	3	1	13
British Force in Italy Taranto.	0	0	0	0	1	1	1	1	0	0	4	1	1	10
VIth Italian Army (Excluding French and British) Mean strength 201,389					0	2	1	2	2	0	1	1	0	9
French Army in Italy. Mean strength 48,000					11	5	3	0	1	0	3	2	1	26
Province of Vicenza. Population 500,000		65	102	74	53	35	27	38	57	56	42	15	20	584
Kingdom of Italy. Population 35,000,000.		1674	2142	2121	1403	1246	1348	959	1278	2084	1215	891	949	17,310

D I P H T H E R I A.

Reference to TABLE XXII shows a somewhat unusual state of affairs, viz. a considerable number of cases in our forward area, 141 for the year, while the French and Italian Troops in the same area were but little affected. The cases were spread over the whole year with, as is usual, the maximum in the cold season until the month of July when we had 30 cases and a further 20 in August. Our Base and L. of C. troops were relatively unaffected and even the civilian figures are in no wise out of the ordinary. In this connection it will be noted that the relative incidence per month coincided fairly closely with our experience, i.e. maximums in February followed by marked rises at the end of the third quarter of the year.

Comparative statistics for other theatres of war are not available and information is relatively scanty, but Labit (Arch. de méd. et de pharm. mel. 1917. 67) drew attention to the fact that in Touraine where Diphtheria is always present and where indeed Bretonneau and Trousseau did their original work, there was an outbreak in 1915 among the troops with 1450 cases and 26 deaths, the greatest incidence being in September when there were 320 cases, representing 3% of the effectives. During 1916 and 1917 also considerable/

considerable numbers were affected, but by that time the danger was fully realized and prophylactic measures minimised the numbers.

From the clinical point of view it was frequently observed during the war that Enteric Fever and Diphtheria were not seldom combined, e.g. Rathery at the Zuydcoote Hospital saw 109 cases of Diphtheria among 4,198 cases of Enteric and noted that the prognosis in these cases is grave (29% mortality).

TABLE XXIII. SCARLET FEVER.

	1917 Dec.	1918 Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	
British Force in Italy Forward Area. Mean strength 78,477	7	22	9	7	5	3	1	2	2	0	0	0	0	58
British Force in Italy Base & L. of C. Mean strength 17,809	0	2	2	1	3	0	1	0	3	0	1	2	0	15
British Force in Italy Taranto.	0	1	2	0	0	0	0	1	0	0	0	0	0	4
VIth Italian Army. Mean strength 201,389					3	1	2	1	1	3	2	2	2	17
French Army in Italy Mean strength 48,000					4	3	1	1	1	1	0	1	0	12
Province of Vicenza Population 500,000		16	9	10	8	19	10	7	3	22	3	0	0	107
Kingdom of Italy Population 35,000,000		752	700	807	718	782	877	567	554	840	406	254	344	7,601

TABLE XXIV.

BRITISH FORCE IN ITALY : DEC. 1917 - DEC. 1918 (Inclusive).
FORWARD AREA, BASE & L. of C. (TARANTO excluded)

TYPHOID GROUP OF DISEASES & SCARLET FEVER : COMPARATIVE TABLES SHOWING STATE OF ANTI-TYPHOID INOCULATION OF CASES ADMITTED.

		Interval (in months) elapsing since last Inoculation with T.A.B. Vaccine.																Over 36	Inoc'n Refus'd.	No Inform^{n}.	Totals
		1	2	3	4	5	6	7	8	9	10	11	12	15	18	24	36				
TYPHOID GROUP	Forward Area.	2	3	11	3	7	9	15	12	5	5	9	5	16	9	3	4	5	3	8	134
	Base & L. of C.								1	1	1			1				1	1	2	8
	Totals	2	3	11	3	7	9	15	13	6	6	9	5	17	9	3	4	6	4	10	142
SCARLET FEVER.	Forward Area.	2	2	1	4	3	2	2	5	2	2	1	1	9	1	1	1	-	-	19	58
	Base & L. of C.				1		2		3	1		1	3	1		1				2	15
	Totals	2	2	1	5	3	4	2	8	3	2	2	4	10	1	2	1	-	-	21	73

ANALYSIS OF CASES ADMITTED WHERE DATE OF ANTI-TYPHOID INOCULATION IS AVAILABLE.

		Period elapsing since date of Anti-Typhoid Inoculation.					Totals
		6 months & under	7 - 12 months	Total 12 months & under	Over 12 months	Never Inoculated	
TYPHOID GROUP	Cases	35	54	89	39	4	132
	Percentage	26.5%	40.9%	67.4%	29.5%	3.0%	
SCARLET FEVER.	Cases	17	21	38	14		52
	Percentage	32.7%	20.4%	73.1%	26.9%		

SCARLET FEVER.

The number of Scarlet Fever cases was not great among any of the troops and out of a total of 58 cases in our own forward area 22 occurred in the month of January 1918 - a small epidemic patch.

But from the epidemiological point of view the figures given in TABLE XXIII tend to bring out a somewhat interesting though decidedly controversial point.

Ker (Infectious Diseases 1920, page 593) in discussing the co-existence of infectious diseases states "The enteric patient, on the other hand, almost seems to possess some degree of immunity towards that disease (Scarlet Fever)." And again (loc. cit. page 594) "It is a curious fact, however, that none of the hundreds of susceptible children who have passed through our enteric wards have ever contracted scarlatina in their convalescence."

Now it will be seen from TABLES VI & XXIII that apart from 3 cases (which incidentally occurred in the first week of October) no cases of Scarlet Fever occurred among the civilian population of the Province of Vicenza for 17 weeks from October 7th to January 31st, although during this period cases were notified among troops in the same area. Further it

was noted that during the corresponding months of the previous year cases were always present. Such a long absence of this disease from a population numbering roughly half a million, appeared very exceptional. A similar occurrence was seen in Flanders in 1915 and has also been noted in England (Maidstone 1896 and Lincoln in 1903). In each case this great rarity of Scarlet Fever has followed an epidemic of Enteric.

It would appear almost as if it were a case of collective protection against a subsequent disease, viz. Scarlet Fever, by the epidemic prevalence of the earlier disease, viz. Enteric.

In this connexion, and as a matter of interest, we worked out statistics (see TABLE XXIV) relating to all cases of Scarlet Fever and the Typhoid group occurring among British Troops, with reference to the period elapsing in each case between the date of contracting the disease and the date of Anti-typhoid inoculation. The sets of figures for both these diseases appear to be somewhat curiously alike.

TABLE XXV. M E A S L E S.

	Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
British Force:Forward Area. Mean Strength 78,477	6	5	8	5	2	0	0	0	1	0	0	0	0	27
British Force in Italy. Base & L. of C. (excluding Taranto) Mean strength 17,809.	0	1	1	9	2	1	0	1	0	1	0	0	1	17
British Force in Italy. Taranto. (Mediterranean L. of C.)	11	69	17	43	4	0	0	1	1	0	0	7	0	153
Sixth Italian Army (Excluding French and British Troops) Mean strength 201,389					13	31	14	2	4	1	4	4	3	76
French Army in Italy. Mean strength 48,000					6	3	3	1	0	3	0	0	0	16
Province of Vicenza. Civilians & Refugees. Population. 500,000		111	73	80	134	143	108	105	42	13	9	0	2	820
Kingdom of Italy Population 35,000,000		3197	4945	7765	8106	9036	11658	7369	4199	3197	1434	794	1116	62,816

TABLE XXVI.

R U B E L L A.

	Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total.
British Force in Italy. Forward Area. Mean strength 78,477	0	0	4	6	4	8	0	1	0	1	0	0	1	25
British Force in Italy. Base & L. of C. (Taranto excluded) Mean strength 17,809	0	3	5	0	3	1	0	0	0	0	0	0	0	12
British Force in Italy. Taranto. (Mediterranean L. of C.)	0	0	1	0	8	1	0	0	0	0	0	1	1	12

Rubella is not notified in French or Italian Army nor by Italian Civilians.

TABLE XXVII.

E R Y S I P E L A S.

British Force in Italy Forward Area. Mean strength 78,477	1	3	4	2	1	0	0	2	0	4	1	0	3	21
British Force in Italy. Base & L. of C. (Taranto excluded) Mean strength 17,809.	0	1	0	0	0	0	0	0	1	0	0	0	0	2
British Force in Italy. Taranto.	0	0	1	2	1	1	0	0	0	0	0	0	0	5
Sixth Italian Army. (Excluding French & British) Mean strength 201,389	-	-	-	-	25	30	6	4	2	6	1	2	15	91

Erysipelas was not notifiable by other formations nor by Civilians.

M E A S L E S.

No points of epidemiological interest emerged apart from the fact that, as was to be expected, Taranto with its considerable percentage of native labour troops accounted for nearly all our cases.

R U B E L L A.

This condition was not notifiable except among our own troops.

There is under this heading nothing of interest to note.

E R Y S I P E L A S.

While sporadic cases occurred in all armies and in all theatres of war, at no time did it ever assume the epidemic proportions of pre-Listerian days.

TABLE XXVIII. MUMPS.

	Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	
British Force in Italy. Forward Area. Mean strength 78,477	4	15	9	18	17	17	9	7	3	2	1	3	6	111
British Force in Italy. Base & L. of C. Mean strength. 17,809.	0	1	1	5	2	1	1	0	0	1	1	0	1	14
British Force in Italy. Taranto.	6	14	30	49	45	19	14	7	5	53	72	7	5	326
VIth Italian Army. Mean strength 201,389					50	73	26	14	13	9	2	13	22	222
French Army in Italy. Mean strength. 48,000.					68	42	24	6	9	33	25	5	17	229

Mumps is not Notifiable among Civilians in Italy.

TABLE XXIX. SPIROCHAETOSIS ICTERO-HAEMORRHAGICA.

British Force in Italy. Forward Area. Mean strength. 78,477.	0	0	0	0	0	0	0	0	0	1	0	0	0	1

M U M P S.

As will be seen from TABLE XXVIII Sporadic cases of Mumps occurred the whole year round, but no points of aetiological interest emerge from the available statistics as mumps is not notifiable among civilians in Italy. The figures for the French and Italian troops show more than double the incidence there was among our troops for the same period as far as the forward area is concerned.

The relatively high incidence at Taranto can again probably only be correlated with the large number of native labour companies there - from countries where they had never before been exposed to infection.

SPIROCHAETOSIS ICTERO-HAEMORRHAGICA.

Only one case of this occurred among the British Troops in Italy and it was in the forward area.
The French and Italian troops of the VIth Army reported no cases - a condition of affairs contrasting favourably with statistics from the Western front where the disease occurred in both French and German as well as in the British Armies.

Our immunity in Italy can in all likelihood be correlated/

correlated with the comparative absence of rats in the trenches on the Asiago Plateau - the urine of rats containing the spirochaete being the probable infective agent according to Japanese workers.

The case-mortality in Europe has never approached the 30% as estimated by the Japanese.

Wilmaers and Renaux in the Belgian Army found a mortality of only 4% - the figure also quoted by McNee for the British troops on the Western front.

TABLE XXX.

A N T H R A X.

	Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	
British Force in Italy Forward Area. Mean Strength. 78,477.	0	0	0	0	0	2	0	0	0	0	0	0	0	2
British Force in Italy Base & L. of C. (Taranto excluded) Mean strength 17,809.	0	0	0	0	0	0	0	0	0	0	0	0	0	
British Force in Italy. Taranto.	0	0	0	0	0	0	0	0	0	0	1	0	0	1
Sixth Italian Army. (Excluding French & British) Mean strength 201,389.	0	0	0	0	0	1	0	0	0	0	0	1	0	2

TABLE XXXI.

T E T A N U S.

British Force in Italy. Forward Area.	0	1	0	0	0	0	0	0	0	0	0	2	0	3
British Force in Italy. Base & L. of C.	0	0	0	0	0	0	0	0	0	0	0	0	0	
British Force in Italy. Taranto.	0	0	0	0	0	0	0	0	0	0	0	0	0	
Sixth Italian Army.	-	-	-	-	0	1	0	0	0	2	1	3	1	8

A N T H R A X.

Nothing of interest to note.

T E T A N U S.

As was found to be the case with most of the belligerent countries, the incidence of Tetanus showed a very rapid decline in the British Army after the first few months of war, due to improved sanitary precautions, more rapid cleansing and dressing of wounds, but most particularly of course to the use of prophylactic injections of A.T.S. in all wounded.

The cases in TABLE XXXI therefore may be taken as a fair average and do not show anything in particular.

Tetanus had, long before 1918, practically lost its terrors from the military point of view, though the seriousness of it in the early days of the war should be remembered, e.g., Gussmann in an analysis of 390 cases in the German Army on the Western front states that 61.29% died as against 38.71% recovering, figures which correspond pretty closely to those published by Bruce for the British Army cases in 1915.

TABLE XXXII. TRACHOMA.

	Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	
British Force in Italy. Forward Area. Mean strength 78,477.	0	0	0	0	0	1	0	0	0	0	0	0	0	1
British Force in Italy. Base & L. of C. Mean strength 17,809.	0	0	0	0	0	0	0	0	0	0	0	0	0	-
British Force in Italy. Taranto.	0	0	1	0	0	1	0	0	1	1	1	0	0	5
VIth Italian Army. Mean strength 201,389.	-	-	-	-	6	1	5	4	7	12	6	5	10	56

Not Notifiable among Civilians.

TABLE XXXIII. MALTA FEVER.

British Force in Italy. Forward Area. Mean strength. 78,477.	0	0	0	1	0	0	0	0	0	0	0	0	0	1
British Force in Italy. Base & L. of C.				Nil										
British Force in Italy. Taranto.	1	0	0	0	0	0	1	0	0	0	1	0	0	3
VIth Italian Army.				Nil										
French Army in Italy.				Nil										
Civilians	Not Notifiable.													

T R A C H O M A.

Reference to TABLE XXXII shows that one case occurred in our forward area and 5 cases at Taranto.

The VIth Italian Army shows 56 cases while the French had none. The condition is not notifiable among the civilian population though a considerable amount of it exists, more especially in the south.

MALTA FEVER.

Here again only one case occurred in our forward area. As was to be expected a few cases appeared at Taranto but only three cases actually arose there, which may be considered very satisfactory.

TABLE XXXIV. CHICKEN POX.

	Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	
British Force in Italy. (Forward Area) Mean strength 78,477	0	0	1	0	0	0	0	0	0	0	0	0	0	1
British Force in Italy. (Base & L. of C.) Taranto excluded. Mean strength 17,809.	0	0	0	0	0	0	0	0	0	0	0	0	0	0
British Force in Italy. Taranto.	0	1	1	1	9	9	7	9	4	4	6	2	0	53
VIth Italian Army. Mean Strength 201,389.					0	0	1	1	0	1	2	0	4	9
	Chicken Pox not notifiable in French Army or by Civilians.													

TABLE XXXV. T Y P H U S.

Kingdom of Italy. Population 35,000,000		0	0	2	1	12	14	0	2	0	0	0	0	31

There were no cases of Typhus among Italians, French or British Troops and no cases among the Civil population of Vicenza Province.

CHICKEN POX.

As will be seen from TABLE XXXIV there was only one British case in our forward area and 9 cases in the VIth Italian Army.

As it is not a notifiable disease among the civilian population no statistics for them are available.

The high incidence of 53 at the Taranto Base is almost certainly due to the reliatively high percentage of native labour contingents there - probably very susceptible because never before exposed to this infection.

TYPHUS FEVER.

The British Armies in all theatres of War were singularly lucky in escaping this dreadful scourge which to many of the countries engaged in the Great War was the most dire in its results of all the epidemic diseases.

Within 6 months of the outbreak of war this condition - always slightly endemic in the Eastern countries of Europe, particularly in Russia, Russian Poland and Galicia - had lighted up into a blaze and the/

the conflagration spread through the Balkans like wild-fire.

It would appear from a perusal of the continental literature on the subject that the Russian Armies were most often the infecting agents, and wherever large numbers of Russian prisoners of war were taken - there Typhus broke out.

Petschacher (Wien. med. Wchnschr. 1917. 67) reported on its effect in Austria whence it was carried by Russian prisoners.

In the German Army Ernst (Zeitschr. f. med. Beamte 1918. 31), Schöne (Münch. med. Wchnschr. 1918. 65) and Hillenberg (Epidemiologische, Klin. and Serolog. Beobachtungen bei Fleckfieber, 1918) among others, report on various epidemics in parts occupied by the Germans. Epidemics in Rumania in 1917 and 1918 were described by Külz (Arch. f. schiffs-u-Tropen Hyg. 1918. 22).

In Serbia too Typhus was responsible for one of the darkest hours of her history (in 1915).

According to Macpherson (Medical History of the War) the total number of Typhus cases in the British Armies in all theatres of war was only 998, of which 221 were fatal.

Their distribution was as follows:-

Theatre/

Theatre of War	Cases	Deaths	Case Mortality.
France	5	-	-
Egypt	366	80	21.8%
Mesopotamia	593	135	22.4%
Army of Black Sea	29	6	20.6%
Salonika	5	-	-

In the whole Kingdom of Italy for the year under review there were only 31 cases of Typhus with the maximum in May and June. These cases all occurred in the southern portion of Italy and there were no cases of Typhus among Italian, British or French troops, and no cases among the civil population of the Province of Vicenza.

TABLE XXXVI.

BRITISH FORCE IN ITALY : FORWARD AREA.

ADMISSIONS FROM ALBUMINURIA & NEPHRITIS : 1918.

(Summary of Weekly Returns)

		First Quarter.			Second Quarter.			Third Quarter.			Fourth Quarter.			Totals.	Total Annual Incidence per 1000 mean strength.
		Jan	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.		
		Weeks:- 1-4	5-8	9-13	14-17	18-21	22-26	27-30	31-34	35-39	40-43	44-47	48-52		
5th Divn.	Albuminuria	25	11	7		Left for France.								43	
	Nephritis	3	5	3										11	
41st Divn.	Albuminuria	34	8	1		Left for France.								43	
	Nephritis	12	7	2										21	
7th Divn.	Albuminuria	32	20	10	4	7	2	-	1	1	-	-	-	77	
	Nephritis	8	7	6	8	3	2	1	3	1	-	-	-	39	
23rd Divn.	Albuminuria	20	11	5	2	-	1	-	-	1	-	-	-	40	
	Nephritis	3	20	9	5	5	3	1	-	-	-	-	-	46	
48th Divn.	Albuminuria	16	6	-	1	-	-	-	1	-	-	-	-	24	
	Nephritis	4	4	2	4	6	2	-	1	-	1	1	-	25	
Other Troops	Albuminuria	9	7	2	2	-	2	1	2	-	1	-	1	27	
	Nephritis	2	6	2	5	6	2	-	2	-	-	-	1	26	
Totals	Albuminuria	136	63	25	9	7	5	1	4	2	1	-	1	254	3.2
	Nephritis	32	49	24	22	20	9	2	6	1	1	1	1	168	2.1
Average Strength		(Mean) was 78477.													

ALBUMINURIA AND NEPHRITIS.

This condition attracted a great deal of attention during the war and a vast amount of work was done in connection with it, and much written about it without any very satisfactory conclusions being arrived at.

In France up to February 1915 the number of cases was not more than one would expect from an equal average body of civilians, but from March 1915 onwards and until the end of the war considerable numbers of cases occurred.

At first considered due to trench life and called 'Trench Nephritis', it was latterly found not to be confined to the forward area but occurring on the L. of C. as well, and it was accordingly named "War Nephritis".

Prolonged investigations however have failed to prove that it differed from nephritis of civil life, except in degree of incidence.

Moret (Arch. méd. belges 1917. 70) stated that Belgian troops suffered less than the French, and that British soldiers were more affected than those of the other allies. He laid stress on fatigue with production of muscle-toxins as a predisposing influence and came to the conclusion that War Nephritis was not

a/

a new disease but simply an ordinary nephritis which owing to the type of campaign had become extremely common among soldiers.

Meyer and Nassau considered that the renal engorgement responsible for orthostatic albuminuria disposed to War nephritis, though it was not the actual cause.

Goldscheider in a critical analysis of cases (Ztschr. f. phys. u. diätet. Therap. 1917. 21) found that only 5% of all cases had previously had nephritis. Older soldiers were more prone to it and he formed the opinion that the disease was due to infection which in the majority of cases was favoured by cold and fatigue (the Infantry provided 78% of the cases in his series). He thought that the infective hypothesis gained support from the fact that small epidemics broke out among successive bodies of men drafted to a given locality.

British workers, e.g. MacLean and de Wesselow and others have worked along the same lines and while an infective hypothesis was often mooted they held that the infection was not a specific one but might be that of bronchitis, influenza or trench fever etc., as nephritis is such a frequent complication of many infections even of a trivial initial illness.

To conclude one must admit that the aetiology was obscure.

The/

The TABLE XXXVI shows the admissions for albuminuria and nephritis by quarters and is compiled from the weekly returns re this condition, which had to be rendered by all medical units.

Cases returned as Nephritis showed evidences of blood as well as of albumin in the urine. It will be seen from the table that, for the first quarter while we had five divisions in the force - all straight from active and arduous operations on the Western front - the number of cases was considerable.
By April there was a very marked diminution and in the fourth quarter there were only 2 cases of albuminuria and 3 of nephritis.

In fact from the point of view of Nephritis it would appear that the Italian front was almost a health resort for our troops!

TABLE XXXVII.

SMALL POX.

	Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	
British Force in Italy. Forward Area. Mean strength 78,477.	0	0	0	0	1	0	0	0	0	0	0	0	0	1
British Force in Italy Base & L. of C. (excluding Taranto) Mean strength 17,809.	0	1	0	0	0	0	0	0	0	0	0	0	0	1
British Force in Italy. Taranto.	0	0	0	0	0	0	0	0	0	0	0	0	0	
Sixth Italian Army. (excluding French & British Troops) Mean strength 201,389.	-	-	-	-	9	0	3	0	0	4	0	0	0	16
French Army in Italy. Mean strength 48,000	-	-	-	-	0	0	0	0	0	0	0	0	0	
Province of Vicenza. Population 500,000	-	16	14	32	21	5	3	0	0	0	0	0	0	91
Kingdom of Italy. Population 35,000,000	-	508	491	499	308	289	248	147	130	220	103	249	888	4080

SMALL POX.

TABLE XXXVII

shows that there were only two cases of small-pox in the British Forces in Italy - one case occurring in January on the L. of C. and one case in the forward area in April in the midst of a small epidemic in our billeting area.

There were no cases in the French Army, but 16 in the VIth Italian Army.

The Province of Vicenza shows 91 cases for the year while the total number of cases in the Kingdom of Italy for 1918 was 4080.

Smallpox is of course endemic in Italy, more particularly in the vicinity of Naples and in the south.

In the first quarter of the year quite a few cases, as can be seen, occurred in Vicenza Province - practically all being confined to a few villages in one of our billeting areas.

The result shows what firm administrative measures can achieve. The immediate vaccination of all British officers and men was ordered and, as vaccination is compulsory in our Army, there was no difficulty in rapidly carrying out this measure.

We also kept a very watchful eye - to them no doubt often an unpleasantly watchful eye - on the civilian/

civilian population. And that it was very necessary soon appeared obvious. In one house visited, with small pox patients, the plaster of one wall was noticed to be deficient - one could see through to the next building, a small general store from which our troops as well as the local inhabitants bought goods.

We even found that people in infected houses who had been quarantined saw no harm in writing and posting letters to relatives and friends in other parts.

In fact observation of this small civilian epidemic only served to make it appear providential that it did not assume much larger proportions.

The only theatres of war in which there was any degree of prevalence of small-pox were Egypt, Palestine and Mesopotamia. On the French front the British Armies had only eleven cases of small-pox during the whole war.

One must regard these figures as very satisfactory - more so if one takes into account the fact that Germany, proverbially the best vaccinated of countries, did not entirely escape. As a result of the entry into East Prussia of Wolhynian refugees carrying small-pox in 1916 there were outbreaks in various places in North and West Germany, e.g. Paschen (Deutsche. med. Wchnschr. 1918. 44) described an epidemic in Hamburg in 1916 - 266 cases with a mortality of 14.6%.

Kirchner/

Kirchner (Ztschr. f. ärtzl. Fortbild. 1918.15) reported that there were 400 cases in Berlin in 1917 with 40 deaths and estimated that there would be approximately 4000 cases for the whole of Germany.

Indeed von Rembold (Deutsche. med. Wchnschr. 1917. 43) held that the epidemic in North Germany was larger than any since 1870 and affected chiefly those engaged in war-work and usually elderly people with immunity through vaccination much diminished.

In a few cases vaccination evidently failed to confer immunity and some German soldiers vaccinated in January had a mild attack in February and the same sequence was noted in a nursing sister in Germany.

TABLE XXXVIII.

I N F L U E N Z A.

		Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Totals.
B.F. in Italy Forward Area.	Cases	? 100	? 40	? 19	102	2	193	4553	145	131	338	3547	1730	614	11,514
	Deaths	-	-	-	0	0	3	11	1	1	3	249	173	40	481
Mean strength 78,477.	Case Mortay. %	-	-	-	0	0	1.5	0.24	0.7	0.7	0.9	7.0	10.0	6.5	4.18
B.F. in Italy Base, L.of C. and Taranto.	Cases										2348	1882	921	423	5574
	Deaths										49	93	39	30	211
	Case Morty %										2.1	4.9	4.2	7.1	3.8
VIth Italian Army.	Cases					0	8847	3498	120	450	1541	7080	2444	1789	25769
	Deaths						-	-	-	12	80	506	300	179	1077
Mean strength 201,389	C.M. %						-	-	-	2.6	5.1	7.1	12.2	10	4.1
French Army in Italy.	Cases						393	394	4	96	756	1601	431	473	4148
	Deaths									4	40	118	31	32	225
Mean strength 48,000	C.M. %									4	5.3	7.4	7.2	6.7	5.0
Province of Vicenza.	Cases											33554	10592	2915	47061
	Deaths											711	362	123	1196
Population 500,000	C.M. %											2.1	3.4	4.3	2.5
Kingdom of Italy.			Not Notifiable.												

TABLE XXXIX.

BRITISH FORCE IN ITALY (ASIAGO FRONT).

	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total.
Average Strength.	102,183	113,759	113,233	93,050	71,193	71,642	68,707	67,547	67,500	65,286	63,284	62,623	60,192	78,477 (Mean)
Influenza Without Complications	? 100	? 40	? 19	98	2	188	4252	125	102	257	1608	1009	377	8,177
With " (severe respiratory)	? -	? -	- -	4	0	5	301	20	29	81	1937	721	237	3,337
Total	100	40	19	102	2	193	4553	145	131	338	3547	1730	614	11,514
Deaths	-	-	-	-	-	3	11	1	1	3	249	173	40	481
Case Mortality %	-	-	-	-	-	1.5	0.24	0.7	0.7	0.9	7.0	10.0	6.5	4.18
Incidence per 1000 average strength	0.98	0.35	0.17	1.1	0.03	2.69	66.27	2.1	1.9	5.2	5.6	27.6	10.2	146.7 Per Annum
Mortality per 1000 average strength	-	-	-	-	-	0.04	0.16	0.01	0.01	0.04	3.9	2.76	0.66	6.1 Per Annum

SIXTH ITALIAN ARMY (ASIAGO FRONT).

Average Strength.					195,000	204115	196141	204961	203074	204926	199996	214292	190000	201,389 (mean)
Influenza. Without Complications	-	-	-	-	-	7773	3248	86	330	1171	6010	1949	1420	21987
With " (severe respiratory)	-	-	-	-	-	1074	250	34	120	370	1070	495	369	3782
Total	-	-	-	-	-	8847	3498	120	450	1541	7080	2444	1789	25769
Deaths					-	-	-	-	12	80	506	300	179	1077
Case Mortality %					-	-	-	-	2.6	5.1	7.1	12.2	10	4.1
Incidence per 1000 average strength.					-	43.34	17.83	0.58	2.21	7.51	35.9	11.41	9.1	191.94 Per Annum
Mortality " " "					-	-	-	-	0.05	0.38	2.53	1.39	0.94	8.01 Per Annum

Not Available.

FRENCH FORCE IN ITALY (ISIAGO FRONT)

Average Strength		Mean average strength 48,000												48000
Influenza Without Complications						393	394	4	96	627	1218	286	425	3443
With "					-					129	383	145	48	705
Totals					-	393	394	4	96	756	1601	431	473	4148
Deaths					-				4	40	118	31	32	225
Case-Mortality %					-				4	5.3	7.4	7.2	6.7	5.0
Incidence per 1000 average strength.					-									86.4 Per Annum
														4.7 Per Annum

Not Available.

PROVINCE OF VICENZA.

Influenza Cases		N.B.	Notification of Influenza							33554	10592	2915	47061
Deaths			only became obligatory here							711	362	123	1196
Case-Mortality %			in October.							2.1	3.4	4.3	2.5
Incidence per 1000													84.12
Mortality per 1000													2.4

I N F L U E N Z A.

GENERAL CONSIDERATIONS.

Italy, in common with other European countries during the period in question, suffered severely from the pandemic of Influenza which in 1918 assumed such alarming proportions over such a wide area.
And along with the rest of humanity in Italy the troops of all nations there suffered very considerably.

As elsewhere we experienced two distinct waves. The earlier wave of comparatively light cases commenced suddenly in March and the maximal incidence occurred in June: the second wave of more serious cases began towards the end of September and reached its maximal intensity during October.

At the beginning of the second wave we formed the opinion that most of the cases were occurring among men who had escaped the first wave, but subsequent experience did not tend to confirm this. Indeed it transpired that while certain units which suffered during the first and lighter wave of the epidemic appeared to escape the second wave almost completely, in the case of other units it was shown that every individual attacked lightly during the summer suffered again severely during the autumn, and that no appreci-

appreciable measure of protection seemed to be afforded against a severe type by a prior light type.

At this distance of time it appears somewhat extraordinary, in view of its known epidemic cycle, that we did not instantly recognise the condition; but it must be admitted that the first wave of "three day fever" found us at a loss for a diagnosis. A considerable body of opinion in Italy considered that it was sand-fly fever, which indeed it somewhat resembled, and curiously enough the same opinion seems to have been formed in Mesopotamia at the commencement of the outbreak there.

Then, when reports came pouring in from other countries and theatres of war, it was referred to as "Spanish Influenza", just as in Germany it appears to have been called "Morbus Ibericus". Hanssen of Kiel (Deutsch. med. Wchnschr. 1918. 44) states that he found records of a "Spanish Sickness" as far back as the years 1566, 1580 and 1592 - all rapidly spreading and claiming many victims: while in the epidemic of 1889-90 there were 55,263 cases in the German Army.

The general opinion was that the course of the epidemic seemed to be from west to east: it prevailed in America in 1917 and appeared on an epidemic scale in Spain in May 1918 whence it invaded France, Italy and Germany and greatly weakened the effective strength of all armies.

Ginns/

Ginns (Münch. med. Wchnschr. 1918. 65) on the other hand, considered that it was brought to England in the first place from China and did not arise in Spain.

INCIDENCE AND EFFECT IN VARIOUS COUNTRIES.

In the United Kingdom Influenza was never absent during the War: in 1916 and 1917 the incidence among the military population alone was 36,072 and 28,980 respectively.

In 1918 the figures remained about normal till June when there was a sudden increase from the usual average monthly rate of about 3,000 to 31,138; the increase was maintained in July but dropped again in August, only to rise once more in October and November. While December and January were fairly average, there was a further rise in February 1919.

The same sequence was noted in France and that same curve with three waves in June and November 1918 and February 1919 was reproduced for the civilian populations of the respective countries.

In Germany the results were the same, and here too the second wave was of the Pneumonic type: according to Weber (Berl. klin. Wchnschr. 1919. 56) there were in Berlin alone in October 1918, 2770 deaths from Influenza and Pneumonia.

Böhm (Wien. med. Wchnschr. 1918. 68) notes that out of the normal population of Vienna (2,200,000) the deaths from Influenza and Pneumonia, which in normal times average 40 to 50 per week out of 700 to 800 deaths from all causes, rose during the height of the first epidemic wave to 123 while in the second wave, at its height in October, they rose to 1,468 per week.

Generally speaking, on the continent the weekly deaths in October rose to at least three times the usual average.

In Italy Morelli (Policlin. 1918. 25) noted the same curves which are shown in the tables herewith, and stated that, while the first cases were mild, the epidemic increased in severity - so much so that Pavesi (Policlin. 1918. 25) cites as instances some Italian Divisions with a sick rate of 90% actually.

ANALYSIS OF STATISTICS.

TABLE XXXVIII

shows the number of cases with deaths and case mortality occurring in each month in our Forward Area and Base and L. of C., in the Italian and French troops of the same Army and among the civilians of the Province of Vicenza.

For our Base and L. of C. the figures are incomplete/

incomplete as notification for Influenza only came into force in September.

In Vicenza province notification only became compulsory in October, while for the rest of the Kingdom of Italy no figures are available, unfortunately, as it was not made notifiable at all.

It will be noted that the two waves are shown very distinctly, but whereas in the British and Italian troops the crest of the first wave in June and May respectively is higher than the crest of the second wave, the opposite held good among the French troops. But the case mortality of the second wave was very much higher among all.

Out of 4553 cases in our troops in June there were only 11 deaths while in 3547 cases in October there were 249 deaths.

The Case Mortality for October was much the same for all the troops, i.e. 7% for the British, 7.1% for the Italians and 7.4% for the French.

For the whole period the case mortality among the troops was from 4.18% (British) to 5% French: which compares quite favorably with the average case mortality of this epidemic throughout the world which has been estimated at 5% to 10%.

TABLE XXXIX./

TABLE XXXIX

shows the same figures as above, but in addition a sub-division of cases into

(a) those without complications

(b) those with severe respiratory complications.

The deaths, case mortality per cent, incidence per 1000 average strength and mortality per 1000 average strength are also shown.

As regards case mortality among British Troops, the highest was registered in November, viz. 10%: the highest recorded by the Italians was 12.2%, also in November. The French highest was only 7.4% but as theirs were more constant their total case mortality was after all the highest of the three.

Disregarding the figures for the civilian population of Vicenza, which are too small for any conclusions to be drawn, the figures may be conveniently summarized as follows:-

	Case Mortality.	Incidence per 1000.	Mortality per 1000.
Italian	4.1%	191.94	8.01
French	5.0%	86.4	4.7
British	4.18%	146.7	6.1

When one looks back one can only feel relieved that the mortality among our troops was not greater, for it should be noted that it so chanced that we were on the crest of both epidemic waves during active operations.

In/

In June, when the epidemic was at its height for the first time, we were heavily attacked on the Asiago Plateau by the Austrians, but held our ground and had neither to advance nor retreat, so that our hospital administration was in no way disorganised.

It was a very different story in October to November, for it was on 24th October after forced and exhausting marches, carried out secretly and with a consequent minimum of preparation, that we launched our final attack which compelled Austria to sue for an armistice.

These operations lasted from 24th October to 4th November and were carried out under conditions of well nigh maximum hardship. We had to force a passage across the Piave river, at that point one and a half miles broad and consisting of numerous channels dotted with islands. Owing to the strong current, enemy shell-fire, and enemy bombing planes, our pontoon bridges were repeatedly broken and numerous men were drowned in the crossing: many of the shallower channels had to be forded, and as a result dry feet and dry clothing were, I imagine, unknown. The initial resistance overcome, the enemy made a last stand on the river Monticano and when we forced this on the night 29th - 30th October their defeat, as Lord Cavan said in the official dispatch, "became a rout".

It has been said and said truly that there is only/

only one sight as terrible as that of an army in retreat and that is an army advancing. As we pushed forward it was to find a devastated and despoiled country with not a thing left to eat. Everywhere we found starving and sick civilians, starving Austrian wounded and sick left behind in the retreat - everywhere starvation and death.

Our troops, as they got further from the river, found rations grow more and more scanty because it was not till weeks later that bridges of any size could be constructed across the wide Piave river. Indeed bully beef, biscuits, cheese and tea were our staple diet. In other words, the wonder is that our mortality from Influenza was not much greater, for the troops were wet, exhausted, monotonously fed and surrounded with sickness, poverty and death among civilians and Austrians.

To make the point clearer still, I may be pardoned citing a personal experience as evidence of the adverse factors surrounding us.

Our final objective was Sacile - a village on the Livenza river, and when I entered it an hour or so after we had driven out the Austrian rear-guard, I at once proceeded to take over two Austrian hospitals there. Only a few patients were still alive and none had had any food for several days as hospital staffs with all food had joined the retreat.

In/

In one hospital of about 150 beds, I found over 90 corpses - some dead in bed, others lying dead under their beds where they had crawled in fear of our final trench-mortar bombardment against the enemy rear-guard. Most of these I judged to be deaths from Influenza and when I got a party of local civilians to carry them out I found the mortuary already quite full of decomposing bodies which the Austrians had evidently not had time to bury.

Three days later when the Armistice was signed, I myself was carried back to that same hospital - as a patient - also with Influenza.

Undoubtedly I think we had reason to be thankful for the fact that the mortality in October - November kept as low as it did, considering all the adverse factors to be contended with.

SUMMARY OF PROPHYLACTIC MEASURES.

In the course of this thesis an attempt has been made to draw attention to the great difficulties encountered in modern warfare, waged under modern conditions, in attempting to eradicate or keep within bounds the incidence of epidemic and preventible disease.

Repeated reference has been made to the conditions existing in the particular "zona di guerra" in Italy in which we were operating - crowded with troops of different nations as well as with its normal inhabitants reinforced by hordes of refugees - this whole teeming population compressed into an area where modern sanitary methods were practically unknown.

In dealing with this situation from the administrative medical point of view, where the crowded inhabitants might almost be compared to a great mass of combustible material only awaiting an incendiary spark to burst into conflagration, certain prophylactic measures, medical and administrative, clearly emerged, and may now conveniently be summarized.

A. MEASURES TO CONTROL THE ITALIAN CIVILIANS IN THE AREA.

This was in our opinion one of the most important items/

items, if not the most important indeed on the programme. It required a considerable amount of tact and sometimes tactful firmness on the part of all ranks and branches of the service to impress continually on the civilians, by example and precept, the necessity for modern sanitary measures in fighting communicable disease.

Thanks to the system of inter-notification of infectious disease which we initiated with the Italian medical authorities, we were not only kept aware of such cases as were reported but were able to follow them up and take such measures as were deemed advisable and practicable to safeguard our own troops. Under this heading are included the removal of our troops from infected billets and the putting out of bounds to British Troops infected houses, shops or villages.

Further it was largely due to our representations that an attempt was made to provide adequate hospital accommodation for civilian cases.

We also encouraged them to come to us for help, and wherever possible we did help them - in removing cases to hospital, disinfecting premises, supplying disinfectants and even sanitary fittings, etc.

B./

B. MEASURES WITH REFERENCE TO ALLIED TROOPS.

Immediately on our arrival in Italy every effort was made to establish a particularly close "medical entente" with the Italian and French Troops with whom we were operating. In addition to the interchange of infectious disease notifications, we did our best to encourage free discussion of difficulties met with and results obtained. Not only in the heat of battle when we treated their wounded alike with our own, but also in the more peaceful paths of preventive medicine our relations with our neighbours were uniformly cordial.

Reference has already been made to the endeavour we made to standardize terminology in dealing with the epidemic of diarrhoeal diseases - in the hope that we might produce statistics which would be comparable and so mutually helpful.

C. MEASURES AMONG OUR OWN TROOPS.

1. Insistence on a high standard of Sanitation in all units.

All our administration aimed at producing and maintaining a high standard of sanitation in all units.

In this connection the work of the Sanitary Sections was of paramount importance and although each/

each unit was self-supporting in this respect, the continuous patrolling of the area by the sanitary sections for the discovery and rectification of nuisances helped materially in preserving a high standard.

Under this heading are included disinfection and cleanliness of billets, cook-houses, food-stores, mess-rooms, baths and ablution places, latrines, incinerators, horse lines and manure-dumps.

Provision of laundries and disinfecting stations for dealing with the louse problem had also to receive due attention.

2. Food inspection.

Dietary was closely supervised and, during the summer when fruit was suspected as a subsidiary cause of diarrhoea, an endeavour was made to limit the quantity consumed and to ensure that it was of good quality and clean.

Food stores were rigidly inspected and as far as possible were made fly-proof and dust-proof.

Cook-houses and the personnel thereof were very closely supervised and every endeavour was made to exclude possible "carriers".

Troops were encouraged to wash their hands before meals and to keep their eating utensils thoroughly clean.

3. Water discipline.

Although, as has been pointed out, the water supplies were as a rule above suspicion, the usual method of chlorination was insisted upon and regular inspections of water-carts were carried out by the water personnel of the Sanitary Sections. All sources of water supply were regularly tested both chemically and bacteriologically.

4. Hospitalisation.

The setting aside of special hospitals for special cases or groups of cases, e.g. diarrhoea-dysentery, was also a most important administrative measure. The consequent centralization economised staff and materials, and in this connection the siting of the bacteriological laboratory at the special hospital helped us still further in obtaining rapid and relatively reliable results.

5. Prophylactic Inoculation and Vaccination.

Under this heading we may include Vaccination against Smallpox, Anti-typhoid Inoculation with T.A.B. and the prophylactic injection of Anti-tetanic serum (A.T.S.) in all wounds and injuries. In Italy, as far as I am aware, no work was done on any big scale on prophylactic injections against Dysentery and the reports from other Armies were conflicting.

But/

But the results obtained by this measure in the conditions for which it has been adapted and proved, point clearly to the fact that in the perfecting of this process and its extension to include other epidemic diseases lies the future hope of preventive medicine from the military point of view.
